Subterranea

The Magazine for Subterranea Britannica

Subterranea Britannica **April 2022 Issue 59**

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Szczecin Shipyard Shelter
Inventive Vents Tour
Centralia Mine Fire
Underground Churches in Crimea

Subterranea Britannica is a society devoted to the study of man-made and man-used underground structures and the archaeology of the Cold War. The society is open to all and its membership includes all walks of life.
Members are invited to contribute to this magazine even if this just means sending very welcome snippets from newspapers and magazines.
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Front cover photo: *Long before Stettin was immortalised by Churchill as the northern extremity of the "Iron Curtain", the Nazi regime was preparing this major (then) German seaport for the coming war. Beneath the banks of the shipyard, an air-raid shelter was constructed capable of accommodating 2,500 workers within a 1.7km network of tunnels. The photograph shows a section of 'Tunnel B', the longest in this curiously irregular-plan complex. Postwar, Stettin returned to Poland, becoming Szczecin. During the Cold War changes and additions were made to the bunker, which appears to have retained a civil defence role until around 2009.*

Back page upper: *A large area of wartime-devastated London was being redeveloped and in 1974 a young architect on his first commission was given free rein to design an underground boiler-house for a housing estate being constructed around it. He came up with a long submarine-like structure with two towering slender vents at either end now usually referred to as the Camberwell Submarine. Photo Clive Penfold*

Back page lower: *In 1962 the long-mined coal seams beneath the town of Centralia, Pennsylvania, USA started burning. As the fire spread, it rendered the ground above ever more unsafe as foundations combusted and dangerous gases seeped through. Sixty years later the town is all but gone and the fire is still burning. Photo from Sopianae*

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Please note : The new committee for 2022/2023 will be elected at the AGM on 23 April 2022

Newsletters of Subterranea Britannica are published by the committee of Subterranea Britannica. Original articles, book reviews, press cuttings, extracts from books and journals, letters to the Editor etc are welcome.
However the Editor reserves the right not to publish material without giving a reason.

The committee of Subterranea Britannica and the Editor do not necessarily agree with any views expressed and cannot always check the accuracy of any material sent in.

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Chairman's Welcome

Tim Wellburn

As the last issue of *Subterranea* went to press, we learned with sadness of the death of Sylvia Beamon, Sub Brit's founder. Martin Dixon's appreciation, together with some members' memories of her, appear in this issue. We also lost Julian Nowill, one of Sub Brit's more colourful members to whom nothing seemed too much of a challenge and who certainly lived life to the full. Each, in their own way, remains inspirational as to what one can achieve with determination.

Sub Brit's scope and expertise has evolved a long way from Sylvia's erudite fascination with Royston Cave and ice houses (although the latter recently had a resurgence on the Forum!). Our spirit of enquiry, however, remains unchanged. This was very clear in the strong demand expressed in last Autumn's membership survey for ever more site visits once Covid restrictions were lifted. The hiccup of the Omicron variant delayed this into the New Year, since when we have been doing our best to seize every opportunity to ramp up a programme of feasible visits.

However, as most of you recognise, Sub Brit is run by a very small group of volunteer members, and we are neither omniscient nor an infinite resource. I have previously noted the benefit of members weighing in with help or suggestions, and this particularly applies to increasing the number of site visits. The results can be surprising and gratifying, as illustrated by the Orford Ness visit first suggested by David Gordon.

Despite the Suffolk location's renowned remoteness and challenging weather, when we helped David set this up as an official Sub Brit trip, it proved so popular that it was an almost instant sell-out. I'm delighted to see that another member, Dave Thomas, has now stepped forward and volunteered to organise a repeat visit. All this came about because David started the ball rolling with his initial trip suggestion on the Forum.

To help make it easier for members to replicate turning ideas for trips into actual visits, we have co-opted Jay Curtis onto the Committee as a dedicated point of contact to provide whatever advice or help you may need to achieve this. With almost one thousand knowledgeable members spread across the United Kingdom and beyond, active membership involvement has the potential not only to fill the diary with visits, but to expand the geographical scope to all areas. Few people know better than you what is on your doorstep – or even what interesting site you stumbled across whilst on holiday!

The mechanics of getting involved in this way and helping make more trips happen are simple. If you know of a site which you think would make an interesting Sub Brit visit, please get in touch with Jay (jcurtis@subbrit.org.uk) with as much information as you may have about it. Obviously, a contact would greatly help, but these things can be researched. We will then do what we can to help turn the idea into reality.

In the meantime, happy site hunting – and Jay is looking forward to hearing from you!

chairman@subbrit.org.uk

At the height of the Cold War the Atomic Weapons Research Establishment and the Royal Aircraft Establishment (AWRE) used Orford Ness for development work on the atomic bomb. Continuing all the way through the 1960s, half-buried concrete structures, often referred to as pagodas, were built to house these weapons. Photo Nick Catford

Sylvia Phyllis Beamon MA Cantab 1936–2021

An appreciation by Martin Dixon

Sylvia was always happiest underground. She is seen here in a souterrain at Goetzlhof, Germany. Photo Phil Marshall

Sylvia Beamon, who died on 30 November 2021, founded Subterranea Britannica in 1974 and was, by definition, our longest-serving member. She combined vision, ambition and determination that helped her achieve her many goals. Although troubled by ill-health in later years, as an Honorary Member she kept in touch with Sub Brit and many individual members; her last contribution to *Subterranea* was published as recently as April 2021.

Sylvia's interest in underground structures mushroomed after she visited Royston Cave and this enigmatic structure near where she lived became the catalyst for her first published work. It also led to the creation of Subterranea Britannica and the initiation of our strong and continuing international relations, and indirectly to her interest in ice houses.

Sylvia Phyllis Beamon was born on 22 February 1936 in the City of London Hospital while her parents lived in Islington, north London. Her maiden name was Rugles – an unusual and rare surname, probably of Huguenot origin. Sylvia was proud that the bells of St Mary-le-Bow could be heard from the hospital and so she could be considered a 'real' cockney. The family moved to Mill Hill in Middlesex when Sylvia was very young.

Sylvia believed her fascination with subterranean structures dated from World War II when sheltering from German air raids. In her own words: "My father cut two trapdoors in our house, one in the living room and the other in the hallway near the front door. He knew there was a cavity below at the back of the house, not shown on the house plans. He put in steps, electric light, tins of food and water plus a hammer and chisel to cut our way out if necessary. My mother's sister, husband, their two children, my parents, my brother Laurence and I all sheltered there in the worst of the airraids – our refuge. I felt safe underground."

Whilst growing up in Mill Hill, Sylvia became a strong advocate of equality and of the importance of community spirit and action. Even as a teenager she campaigned to keep the local youth club open – very much a sign of things to come.

Sylvia married her husband Alan in 1957 and the couple moved to Royston in 1961. In this small market town, she became involved with many community projects, including protesting against the narrow pavements in the town centre in 1965. She appeared with other pram-pushing mothers in the pages of the *Royston Crow* – the first of many appearances in this delightfully named local newspaper. She then became a teacher for the National Childbirth Trust and started the Stork Club for mothers.

Sylvia helped start a playgroup for her children which developed into the Royston Community Association and she was an active member of the Labour Party from the late sixties until 1980. She also campaigned with CND (Campaign for Nuclear Disarmament) against nuclear weapons; perhaps a reason that she never fully embraced Sub Brit's study of nuclear bunkers.

The air raid shelter in Sylvia's house in Mill Hill. When the house was sold in 1977, three of Sylvia's four children - and her parents made their last descent 'down the hole' to see it as it was when used as a shelter in the war. Photo Sylvia Beamon

Sylvia first visited the enigmatic Royston Cave (which is of course man-made) in around 1967 and was convinced that the wall inscriptions dated from the period of the Knights Templar rather than the medieval period which was the then popular assumption. During her research she became aware of some Templar graffiti in the Coudray Tower at Chinon in France's Loire Valley. She made contact with Raymond Mauny, Professor at the Sorbonne and at that time President of what was to become Sub Brit's sister organisation SFES (*Société Française d'Etude des Souterrains*).

In 1985 she attended a slides evening in Maastricht, Netherlands during Maastricht Symposium in 1986. Photo Joep Orbons

Prior to forming Sub Brit Sylvia made contact with Société Française d'Etude des Souterrains and attended an SFES meeting in July 1977. Here she and her husband Alan are seen before a visit to the Les Fontaines Saleés, an Archaeological museum in Saint-Père, Yonne, France

This was the pivotal moment in Sub Brit's founding and Professor Mauny became Sylvia's mentor – a role she valued immensely. Professor Mauny suggested that Sylvia should try to set up a group in the UK with similar objectives to SFES. After much letter writing, the inaugural meeting of Subterranea Britannica took place on 21 September 1974. The first Honorary President was Professor Glyn Daniel of St John's College, Cambridge and Sylvia herself took up the post of Publications Secretary.

Glyn Daniel himself had a fascinating background. In World War II he put his skills in interpreting archaeological sites to good use by becoming a photographic interpreter at RAF Medmenham. Postwar, he was an early presenter of the TV archaeology programme *Buried Treasure*. He was named TV Personality of the Year in 1955 and even appeared on *Desert Island Discs*. Quite a catch, and typical of Sylvia's determination and persuasiveness.

The naming of Sub Brit has an interesting story behind it. An early contender was the alliterative but rather convoluted *The Study of Souterrains and other Subterranean Sites*. It was actually Professor Mauny who came up with the suggestion of *Subterranea Britannica*. He also pointed out that, if adopted, the name would have the same initials as Sylvia – a fitting tribute to its founder!

In parallel with the formation of Sub Brit, Sylvia was undertaking more formal studies and after taking A-levels

in Archaeology and Sociology, she was accepted at Lucy Cavendish College, Cambridge, graduating in Archaeology and Anthropology in 1977. This was a proud moment for Sylvia and her family. In more recent years she put something back into academia by acting as a local mentor to students of her discipline. One of these scholars was Dr James Dilley, now a world expert in flint-knapping and experimental archaeology.

In 1989 she (second from right) is seen in her beloved Royston Cave relating its history to some visitors. Photo Joep Orbons

In the early days, Sylvia saw Subterranea Britannica being structured as a federation of local societies with an 'umbrella' organisation overseeing and coordinating activities. There was little appetite for this format and Sub Brit became a single national body a couple of years later in October 1976 when members and personalities like the late Paul Sowan made their first appearance.

Sylvia's interest in ice houses arose through a combination of research into Royston Cave and contact with SFES. She was presenting at a conference and a SFES member asked, "Could Royston Cave have been built as a *glacière*?" "What is a *glacière*?*",* asked Sylvia.

"In English you would call it an ice house," translated Professor Mauny. "What is an ice house?", responded Sylvia. This exchange piqued Sylvia's curiosity and thus a lifelong interest in underground ice storage was initiated, culminating after many years' work in the publication of her definitive book *The Ice-houses of Britain*, co-authored with Susan Roaf, in 1990.

Sylvia served as an Officer of Subterranea Britannica for ten years, including seven years from 1977 to 1984 as Sub Brit's Chairman (a term she seemed quite happy with – deeds were always more important than words to Sylvia). Throughout this period she received great support from her husband Alan. She was succeeded in 1984 by Paul Sowan whose own tenure as Chairman lasted over twenty years. On her eventual retirement from the Committee Sylvia was justly offered honorary life membership.

Sylvia in 2002 with one of her books Underground Mythology. Photo courtesy Ivor Beamon

Most early Sub Brit conferences were held at Lucy Cavendish College, thanks to Sylvia's Cambridge connections, and our AGM was often preceded by a welcoming glass of sherry in the senior common room. Later our meetings alternated between the Royal School of Mines in London and Lucy Cavendish but eventually we outgrew the accommodation on offer and bid the college and Cambridge farewell.

Sylvia organised and attended many trips across the UK and was a very determined explorer, even if some of the sites' entry and access points proved difficult. A number of older members will recall giving Sylvia a helping hand or strategic push to help at a particular tight spot. On one occasion while being assisted up a vertical ladder from below she uttered the memorable phrase "I wouldn't let many men do that", which of course caused proceedings to halt until the laughter had ceased.

Sylvia continued to make major contributions to our growth and relations with like-minded groups across the UK and overseas. Special mention should be made of two UK-based international weekends of talks and visits organised by her. The first was based in Cambridge in 1978 and the second in Bath in 1992. At the latter we were invited to a civic reception at the Pump Room, the mayoral party being somewhat bewildered to find most of the Sub Brit delegates in caving attire rather than best bib and tucker!

Between 1992 and 1993, Sylvia served as a director of the Council for British Archaeology; she always promoted the archaeological value of underground sites, preserving as they do so many features that are largely lost in above-ground structures.

Sub Britters gather for La Malogne weekend in 2003. Photo Joep Orbons

As well as her acclaimed publication on ice houses, Sylvia published volumes on Royston Cave and on her third key underground research interest which was speleotherapy. An asthma sufferer herself, Sylvia was convinced of the value of breathing in the unpolluted and therapeutic atmosphere offered by both natural caves and man-made (especially salt) mines. She corresponded with many groups across the continent although, ironically, later in life her own health precluded her participating in many conferences on the subject.

Sylvia remained, however, a frequent attendee at Sub Brit conferences and was always a welcoming, inquisitive and caring delegate, naturally keen to search out new members and enquire about their particular interests. Sub Brit made a fitting return to Royston Cave – our spiritual home – in 2010 when we celebrated reaching 1,000 members for the first time. Sylvia's enthusiasm for the enigmatic wall carvings remained as strong as ever.

One of Sylvia's last site visits was one of our most memorable events, when we celebrated our 40th anniversary in 2014 with a banquet in the construction shaft of Brunel's famous Thames Tunnel at Rotherhithe; much as Brunel himself had done in 1827. Sylvia, of course, was our guest of honour. At the time, access to the 'Grand Shaft' was via a short passage that could only be negotiated with a crawl. As ever, Sylvia gamely managed the entrance with helping hands on this occasion from Mark Russell and Ed Combes.

Many Sub Brit members became firm friends and although Sylvia's health sadly deteriorated (her Christmas message was usually in part a summary of the year's travails!) they ensured that they were regularly in touch with her. Even a few weeks before her death, she was still very sharp which made for engaging conversation.

Sylvia even briefly became an investigative journalist. After an incident in March 1991 when Royston was mistakenly connected to the high-pressure gas network, there were numerous resulting fires and explosions. Sylvia felt there should have been an official investigation and in its absence did her own research and wrote *The Royston Gas Incident – the day Royston was nearly blown off the map*, an incisive account published by the town's local history society.

On top of her community and campaigning work and her diverse underground interests, Sylvia and Alan raised a family of four children who eventually made Sylvia grandmother to thirteen and great-grandmother to four. Her son Ivor recalled, "She had a kind and tenacious character, and it rubbed off on us. If you think something is wrong you don't shy away from trying to disprove it. She went with her instincts and didn't go along with the crowd – both in making social change and in her research." Her commitment to the local community was recognised in 2009 with the Royston Town Mayor's Community Service Award. Although they had separated, Alan's death in May 2021 hit Sylvia hard.

Sylvia addressing Sub Brit's 40th anniversary celebration with a banquet in the construction shaft of Brunel's Thames Tunnel in 2014. Photo Joep Orbons

Sylvia's funeral was well-attended, with around a hundred present. From Sub Brit Stewart Wild and Phil Marshall paid their respects on behalf of the wider membership while other members watched the video made available by the chapel. Sylvia had planned most of the service herself including the readings and ensured a mention was made of her thanks to all her friends and colleagues who had supported her over the years.

Everyone who has been a member of Subterranea Britannica owes Sylvia a huge debt of gratitude and there is a sadness that she won't be able to help celebrate our 50th anniversary in 2024. We send our deepest condolences to her children Kevin, Ivor, Murray and Stacey and to their families.

Members' Memories

Sub Brit members who knew Sylvia from the early days of our Society recall their own memories of her.

Rod Le Gear: I have many fond memories of Sylvia whom I had known for well over forty years after she cajoled me into joining the newly formed Subterranea Britannica in the mid-70s.

I remember the many times hurtling up the M11 after work on a Friday night to sit around her dining room table with piles of Bulletin pages collating, stapling and stuffing them in envelopes ready for mailing. It was an enjoyable task as there was a good group of volunteers and always a ready supply of coffee, tea, cakes and much laughter.

Another dear memory is our days as Sub Brit representatives on the Council of British Archaeology (CBA). At lunchtime we would go across the road and wander around Fortnum and Mason deciding what we would order if we won the lottery. We had a fun pact together that if either of us ever got elected as a Fellow of the Society of Antiquaries one would propose the other. Needless to say neither of us ever got elected!

I will miss her knowledge and humour and of course without her vision and drive there would be no Subterranea Britannica.

Phil Marshall: What I remember most about Sylvia was her all-out enthusiasm for everything she got involved with; and she got involved with quite a few things! Her knowledge of Royston was astounding. I remember walking from the station to her house in Honey Way and noticing a small niche in a wall. On mentioning it to Sylvia, she straightway gave me chapter and verse on the thing, without reference to any notes. A remarkable woman; we need more people like her.

Roger Morgan: Sylvia was a bouncy, homely enthusiast and greatly fired up by having got her degree. Gradually, as Sub Brit became more widely known – possibly due to the widely publicised *Ice House Hunt* and Sylvia's definitive book, more younger and male members joined. In some cases this was because they saw it (before the internet) as a way of meeting fellow enthusiasts in the sort of subjects covered by Peter Laurie in *Beneath the City Streets* and Duncan Campbell in *War Plan UK*, and in other cases by (particularly stone) mining enthusiasts for a similar reason. Sylvia was always finding new interesting topics – she led the search for the 'secret tunnel' in Anstey Mound (a moated motte south of Royston), even getting the Royal Engineers to construct a coffer dam in the moat.

Joep Orbons: I first became friends with Sylvia in 1986 at a Sub Brit conference. I was still a student in the Netherlands and Sylvia welcomed me to join the underground group. Up to around 2003, we regularly met at Sub Brit conferences and other meetings all over Europe, always in relation to underground structures.

After 2003, she rarely visited the international conferences but we kept in contact. During holidays in her part of England my family made stopovers at her house and

Sylvia in 2017

enjoyed good food, nice walks and a lively discussion. She was ever so enthusiastic about our children and always made sure the walks were also interesting for them, not just for Sylvia and me, both being archaeologists.

Sylvia was inspiring for many; it worked for me when I was a student. She talked me through a moment during my studies when I was a bit less motivated. She got the inspiration back into me. We still phoned a couple of times a year and had extensive talks about our beloved subjects. I will miss these talks but the good memories remain.

Malcolm Tadd: Barbara and I joined Sub Brit at a study weekend in Bristol and as we were new members Sylvia went out of her way to look after and welcome us. Sylvia, Barbara and I were to become special friends and we and her husband Alan were often together not only in this country but also in France. Sylvia was an entertaining person to be with, always full of ideas and a brilliant conversationalist.

Unlike me she was never lost for words. At a CBA meeting in London one time the chairman said there are various odd organisations on the fringe of archaeology, and "what on earth is Subterranea Britannica." Sylvia was on her feet in a flash and left the audience in no doubt about the importance of underground archaeology and of Sub Brit.

By founding Sub Brit Sylvia changed my and Barbara's lives. Not many of us establish successful organisations but Sylvia saw that underground sites, frequently forgotten, are often the only remaining record of past above-ground activities. Subterranea Britannica is her memorial.

Bob Waixel: I first met Sylvia back in the late 1970s and the first few day conferences I attended were organised in Lucy Cavendish College, Cambridge; this was particularly congenial to myself, as I did (and still do) live in Cambridge, so could cycle down the road for ten minutes to get there. Sylvia always impressed me as having a wide range of interests. Thus Sub Brit grew into the wide ranging, friendly, knowledgeable, ethical and eclectic organisation it now is, and I think this stems in large part from Sylvia's personality.

Our organisation is as welcoming to armchair members as it is to those who like going down holes, and this tolerance and acceptance is unusual and friendly compared to some other organisations that favour the latter over the former. Another of Sylvia's legacies is that she was happy to welcome both types.

Over recent years as ill health got the better of her body, she still managed to attend many day conferences and was as welcoming and friendly as the first day I met her. I shall miss her presence, though her spirit lives on. May her candle continue to burn brightly in the underground spaces we all love.

Stewart Wild: I first met Sylvia at an AGM in the early nineties and was always impressed by her enthusiasm and friendliness. Phil Marshall and I felt privileged to attend her funeral on behalf of Sub Brit. The service took place in a small chapel in Therfield, a village just south of Royston. The chapel was full to capacity, there were many tributes and afterwards Sylvia's wicker coffin was taken to a grave in Royston's municipal cemetery for her final Sub Brit journey. As one mourner observed, "Sylvia was a people person and is greatly missed." All of us at Sub Brit agree, we owe our founder a great debt.

If you can read this, then…..

…..you have enough literary skill to write an article

If you're anything like me you will have enjoyed reading our magazine *Subterranea* and are grateful to everyone who has taken the time to produce an article and illustrate it with fantastic photographs.

This is an opportunity for those of you who would like to write an article on your favourite trips or sites and help others to discover those places.

Don't worry that it has to be fine prose as there is an eager team of sub-editors and proofreaders willing to polish your article into *Subterranea's* style and format. Also, if your photographs are a bit like my 'happy snaps' then it may be possible to enhance them or find alternative shots from other members.

Brief guidance:

- A write-up of any length on interesting sites is always welcome for publication but most articles are between 1,500 to 4,000 words. This might sound a lot but a page of A4 contains approximately 500 words.
- Use your own words, don't just 'cut-and-paste' somebody else's!
- Provide, if you can, a selection of photos – normally around 6 to 8 per 1000 words – and number each one. The highest photo resolution is best (normal jpeg format - not 'raw'!). These can be sent in a separate file – via WeTransfer for example.
- Provide a caption to match each numbered photo. Ideally, insert the photo number and caption into the text of the article where you think it best fits.

These articles provide a valuable history of interesting sites. Whilst we can experience the site secondhand through articles, they are also a resource for planning future visits. The insight authors provide helps to encourage new membership and inspire more trips! So, thank you if you have already contributed.

If you are interested in writing an article please contact me, Dave Maguire, at

dmaguire@subbrit.org.uk

SUBTERRANEA BRITANNICA DIARY

Summary of Forthcoming Events

2022

Sub Brit specific events

23 April AGM plus Spring Day Meeting – Canada Water Theatre SE16 7AR

24 April Site visit to Crossness pumping station

6 - 10 May Maginot Line visit (fully booked)

13 May Orford Ness Site Visit
Trailer tour of the AWRE buildings and Pagodas on Orford beach

25 June Committee Meeting – Online

1 July Copy deadline for *Subterranea* 60

9 July Site visit to Wartling ROTOR Bunker, East Sussex

End August *Subterranea* 60 published

1 October Site Visit to Dumpy Level, Dover Castle

15 – 16 October Edinburgh Visits weekend.

1 November Copy deadline for *Subterranea* 61

15 December *Subterranea* 61 published

Other Underground related events

21 May - 7 June FSG/CDSG Sweden Trip

17 - 20 June NAHMO Conference 2022 “Industrial Minerals”
Grosmont, North Yorkshire

15 - 17 July SFES Congress, Paris, France

September Hidden Earth Association (BCRA) annual caving conference
Dates and venue to be confirmed

For up to date information about these events
please visit www.subrit.org.uk/events
or contact the organisation concerned

If you know of other relevant events run by other societies, please let us know so that they can be advertised in the next edition and on the website

Sub Brit Study Weekend 2022: Edinburgh

Friday 14 – Monday 17 October

We have decided not to hold an Autumn conference this year, but Neil Iosson has taken on the responsibility of organising a study weekend in and around Edinburgh.

The main weekend activities will be on Saturday 15 and Sunday 16 October but there will be optional trips on the Friday afternoon and on the Monday.

For the site visits we will try to capture a flavour of the diverse range of underground structures in this area of Scotland.

The itinerary is still being developed and subject to change but is planned to include:

- Ω Barnton Quarry – huge R4 Rotor bunker (under restoration);
- Ω Wemyss Caves – Iron Age and Pictish carvings in ancient coastal sea caves;
- Ω Anstruther – R3 Rotor Cold War bunker museum ("Scotland's Secret Bunker");
- Ω Craigiebarns – large Royal Observer Corps bunker (restored);
- Ω Gilmerton Cove – mysterious 18th-century underground complex beneath an ex-mining village;
- Ω Mary King's Close – fascinating old tenement buildings in central Edinburgh which were abandoned and then built over. This will probably be on the Friday, as an option.

Members will need to organise their own transport to Edinburgh and we plan to use a coach for out of town trips and public transport to access the local sites in and around the city.

For those members who will need to book accommodation, this must be done independently. The organisers are planning to use the Premier Inn Edinburgh Park EH12 9FX (near the airport) as our suggested hotel. This benefits from free car parking and proximity to the airport, Edinburgh Park station and the tram. It will also be the meeting point for the coach (probably on Saturday).

Booking will open in June and will be advertised on the Sub Brit Members' Forum, also on the Sub Brit website and by email.

For further information, there will be a thread on the Forum with latest updates.

All attendees must be members of Sub Brit for insurance purposes.
Members under the age of 18 must be accompanied by a parent or guardian.

Note: You will need a good level of fitness in order to participate fully in this weekend.
General conditions for Sub Brit weekends are at: www.subbrit.org.uk/docs/tripcond.pdf

Summary Minutes of Committee Meeting – 15 January 2022

The meeting was held online, which again worked successfully.

Participating: Tim Wellburn (in the Chair), Phil Catling, Linda Dixon (sec), Martin Dixon, Chris Gray, Neil Iosson, Tony Radstone, Richard Seabrook, Bob Templeman, Richard West. We welcomed Dave Maguire who was co-opted to the Committee in November.
Apologies from: Jason Hughes and James Buller.

The Committee noted the sad passing on 30/11/2021 of Sylvia Beamon, founder of SubBrit. Stewart Wild, a long-standing member, represented the Committee at her funeral in January.

Matters arising from Reports: Most of the Committee reports were posted to the Forum and, where necessary, discussed in the meeting.

- Tim has spoken with Neil Iosson, who has accepted the nomination to stand for Vice-Chairman
- Sub Brit's financial paperwork has gone to the Accountant
- A grant was approved to Craigiebarns, via Gavin Saxby, to help replace a fence. Phil will speak to Williamson's Tunnels about making an application for a grant.

Spring Meeting and **Annual General Meeting 2022:** Now set for Saturday 23 April at Canada Water Theatre in south London; Phil now has the fourth speaker lined up. Tony has arranged a Crossness visit on Sunday 24 April. Linda will coordinate the bookings process and liaise with Canada Water.

Committee Nominations to be emailed to Linda for coordination for the AGM. Bob confirmed that he would not be standing again – and was thanked for all his past contributions. The Trustees Report had been circulated by Tim and was signed off by the Committee.

Autumn 2022: We agreed 15/16 October for a weekend in Edinburgh, based round Barnton Quarry. Neil is progressing this; there will be no associated conference.

***Subterranea*:** We will profile new Committee members in the next issue.
Articles are now being coordinated by Dave Maguire and we are grateful to Maurice Jones and Mike Tierney for volunteering their services as sub-editors/proofreaders.

"In The Dark" Webinars: There are no new talks in the pipeline, and no members have offered to contribute, so these may have run their course – but have been extremely useful during lockdown. Thanks were given to Tony for all the work getting the speakers and to Richard S for managing the technology. Our focus will now move to trips.

Trips and visits: The Committee has a number of trips in the pipeline – including a tour in May to the Maginot Line, in association with Leger Holidays. Linda & Richard S have created a new checklist for setting up bookings on Eventbrite, to ensure all goes smoothly.

Membership Questionnaire: Tim has arranged a follow-up meeting to discuss the outcomes of the questionnaire and consider changes to be made.

Next Committee meeting: Saturday 25 June, online.

NEWS

Miscellany compiled by Nick Catford

NEWS – ARCHAEOLOGY

Five mammoths found near Swindon

Archaeologists have unearthed the "near-pristine" remains of five Ice Age mammoths while excavating a newly discovered 'graveyard' in a gravel quarry near Swindon. The remains, including those of two adults, two juveniles, and an infant, belong to a species of Steppe mammoth, an ancestor of the Woolly mammoth. More bones are expected to be uncovered as digging continues at the vast quarry site.

The finds have been ranked among the "most important discoveries in British palaeontology".

The Steppe mammoths were the largest of the species, once weighing as much as 15 tons – about two to three times the weight of an African elephant. Tools perhaps used by Neanderthals to hunt the animals have also been found on the site. Researchers estimate the mammoth remains and stone tools are around 220,000 years old.

Excavation at the site began in 2019 after two amateur fossil hunters spotted the remains and a Neanderthal axe in 2017 and alerted archaeology group DigVentures. The team has since recovered bones including tusks, leg bones, ribs, and vertebrae – some of which show evidence of possible butchery marks. Flint tools thought to have been used to clean fresh hides were also found.

Other discoveries at the site include giant elks – twice the size of the animals today, with 10-foot-wide antlers, dung beetles, which used animal droppings for food and shelter, and freshwater snails. Seeds, pollen and fossils belonging to extinct plants have also been uncovered. The area is thought to have once been a fertile plain to which both animals and Neanderthals were drawn as temperatures fell.

SOURCE: *Below*, journal of the Shropshire Caving and Mining Club, Spring 2022

Ice Age bones found in Devon

The remains of a woolly mammoth have been found among a host of hugely significant Ice Age animal remains in a newly discovered cave in Devon. The bones, including those of a woolly rhinoceros, wolf and hyena, are thought to date to the last Ice Age – about 30,000 to 60,000 years ago.

Archaeologists found the remains during work as part of the development of Sherford, a new 5,500-home town near Plymouth. The developers instigated archaeological work at the start of construction in 2015. Excavation during infrastructure work led to the discovery of the animal remains in an area near old lime kilns and Sherford Quarry. They have been classed as of "national signficance" by the archaeologists involved.

A team of archaeologists recorded the finds in situ before removing them for analysis

The remains unearthed so far include the partial remains of a woolly mammoth and a woolly rhinoceros, along with a virtually complete wolf skeleton and the partial remains of a hyena, horse, reindeer, mountain hare and red fox. Woolly mammoths roamed some of the coldest places on Earth before becoming extinct about 4,000 years ago. The bones are now undergoing academic analysis but are expected to be given to the care of Plymouth's new museum, The Box.

The Sherford Consortium – the team behind the development of the new town – said the underground area where the remains were found would be conserved and no construction would take place on top of it. The entrance will be closed and it will not be possible for the public to access the area.

SOURCE: *BBC News,* 15 January 2022

NEWS – CONSERVATION AND HERITAGE

Barnton Quarry gets the go ahead to open to the public

A secret Cold War bunker in Edinburgh that was once Scotland's first line of defence against the threat of a nuclear attack will be turned into a museum after plans were approved by Edinburgh City Council. Buried 100ft below Corstorphine Hill and behind 10ft of reinforced concrete and tank-metal blast doors, the Barnton Quarry bunker has been out of use for nearly 40 years. But now thanks to a hard-working team of volunteers who've spent the last decade clearing, fixing and restoring the Category A listed site, it's set to open to the public for the first time.

Between 1946 and 1982, as the possibility of an attack from Russia loomed, it served as the RAF's operations command centre for all of Scotland's radar stations, scanning the skies for potential threats and gathering data from across the country. The stone quarry itself was operational until 1914 before first being used for RAF fighter command operations from 1942. The nuclear bunker element was built ten years later.

Stretching three floors deep underground, the blast-proof hideout was 'specifically designed to withstand Russian attack'. During the 1960s, the top secret labyrinth was re-designated as a 'Regional Seat of Government' and equipped to accommodate 400 politicians and civil servants for up to a month in the event of nuclear war breaking out.

When the radar base was decommissioned in the early 1980s, ownership was transferred to Lothian Region Council, the local authority for the area at the time. The council subsequently sold the site to James Mitchell, owner of Scotcrown, the company behind Scotland's Secret Bunker, another nuclear command centre near Anstruther in Fife that opened as a museum and visitor attraction in 1994.

View from the top floor down to the ops room floor. At this time the next job was to rebuild the dwarf walls and install the ops room floor. This has now been completed

At the time of being sold to Mr Mitchell, the Edinburgh bunker was extremely dilapidated, having been stripped of all its original contents, repeatedly vandalised and used as an illegal dumping ground by fly-tippers – before suffering extensive fire damage from incidents in 1991 and again in 1993. However, the structure and fabric of the historic base remained intact and it is thought to be the only bunker of its kind still in its original form.

Since 2011, a group of local volunteers have worked tirelessly to restore the bunker back to how it was whilst in operation during the Cold War, with the aim of turning the bunker into a museum and creating conference facilities in the above-level building. The Barnton Quarry Restoration Project, which is funded by Mr Mitchell, has seen the bunker's 'shell' entirely stripped and authentically reinstated.

Painstaking work has also been undertaken to salvage the bunker's intricate ventilation system, with thorough shot-blasting needed to bring it back to life. The team behind the project say they are planning to use "interactive technology" in the museum and install "rotating exhibits, all relevant to the teaching of RAF and Cold War history".

And those hoping to pay a visit might not have to wait too much longer – after planning permission for a change of use, refurbishment and upgrading of the nuclear bunker was granted by the City of Edinburgh Council on 14 February. Submitted in August, the application sought approval to make the site at 35 Clermiston Road North a 'visitor attraction and meeting/conference facility'.

Plans state: "The gradual refurbishment has been ongoing for over a decade, working gradually with the involvement of the local community to put right the fire ravaged shell and reinstate the interior authentically."

Scotcrown are the experienced operator in this field as they already run Scotland's Secret Bunker in Fife and as such have well established contacts to assist them in the task of this sensitive restoration. The vandalism that preceded Scotcrown's acquisition of this unique slice of Edinburgh's more recent history is well on the way to being rectified – this proposal seeks to secure a viable future to ensure that good work is built upon and the complex maintained for the benefit and interest of future generations.

Scotcrown's aspiration for the site has always been the restoration of the bunker into an authentic, historically accurate representation of the functioning bunker. To this end it has been a gradual labour of love for many years now, with the growing involvement of enthusiasts and the local community.

Editor's note: Since the bunker was acquired by James Mitchell, who is a member of Sub Brit, we have had a number of official visits to the bunker before any work started and during the ongoing restoration. We will be back at Barnton Quarry during the Edinburgh Weekend (15–16 October) to see the work nearing completion.

SOURCE: *EdinburghLive,* 16 February 2022

New tourist site opens in Naples

Naples is world-famous for the Roman ruins of Herculaneum and Pompeii, destroyed by the eruption of Vesuvius in 79 AD., but the latest tourist attraction in Naples shows a very different side of the city.

Opening in June, the Ipogeo dei Cristallini -- Hypogeum of Cristallini Street -- is part of an ancient cemetery, located just outside the walls of Neapolis, as the city was called 2,300 years ago.

Not only is the cemetery more than 400 years older than the ruins of Pompeii and the other Roman towns along the Bay of Naples, but it isn't Roman at all. In fact, it was built by the ancient Greeks, who founded Naples in the eighth century BC, and kept it a fully Greek city, even when it came under Roman control centuries later.

It's a game-changing opening, according to archaeologists, that promises to change how we think of Naples, the

Mediterranean in ancient times, and even Greek artistry. It also has, those involved with the project believe, the potential to protect Naples from a tourism boom that, if it continues, could bring overtourism to the city.

Forty feet below the garden of a 19th-century palazzo, in what's now the Sanità area of the city, a steep staircase burrowing underground leads to four tombs. Each with their own grand entrance – one even has Ionic columns sculpted on its façade – they open on to what is thought to have been the original pathway that mourners would have taken.

This is only a small part of the original necropolis, or cemetery, built by the Greeks. In the fourth century BC when the tombs are thought to have been built, dozens of them would have been dug into the hills outside the city walls.

Ancient Greeks built twin-chambered tombs -- one upper chamber, where prayers were said, and a lower one, where the bodies were laid to rest -- by digging out the soft tuff rock, rather like making a cave.

But these are no mere caves. The chambers have been sculpted to resemble real rooms, with fake ceiling beams, benches, staircases and even high-mattress "beds" – sarcophagi, inside which multiple bodies were laid to rest. And these weren't sculpted outside and then brought in. Every single detail – right down to the perfectly plumped "pillows" on those beds – has been carved from the original rock face.

SOURCE: CNN Travel, 18 January 2022

Kent Mining museum opened on 1 April

The long-awaited Kent Mining Museum has finally opened. Based at Betteshanger Country Park, near Deal, the £1.7m, free-to-enter museum pays homage to the county's mining heritage.

It sits inside a new £6m visitor centre, which hosted a series of workshop as part of the Easter break fun. Opening day celebrations started with a colourful parade from schoolchildren, followed by a tour, speeches and toasts to the sound of the Betts Band and Snowdown Choir. Later, families were able to explore the museum and its interactive displays, before trying their hands at craft-making, creating safety lamps, pit checks and snap tins throughout the afternoon.

Other free activities for families to enjoy throughout the Easter holidays included drama and bunting workshops, poetry sessions and walks. The first facility of its kind in Kent, the museum tells the unique story of the county's mining communities and the former Betteshanger Colliery.

Betteshanger Colliery shortly after closure. Photo Nick Catford

Its interactive exhibits will educate, inform and challenge perceptions about the history, using a combination of video and audio content from the miners themselves, as well as displays of historic mining collections. Youngsters can also dress up in mining kit as they explore the museum.

In addition to the museum, visitors will be able to enjoy new experiences around the 250-acre country park including a huge new mining-themed play area, and The Lamp cafe and bar. The project – which has been plagued by delays including money troubles under previous owners Hadlow College and then coronavirus – has been driven forward by the park's new owners Quinn Estates, in partnership with the Kent Mining Heritage Foundation (KMHF). The museum is funded by the National Lottery Heritage Fund, thanks to National Lottery players.

A brand-new Heritage Trail that will traverse the land's colliery connections will also open next year.

SOURCE: *Kent Online,* 2 April 2022

London's Kingsway tram tunnel tours this summer

Rarely opened to the public since it closed in 1952, the Kingsway tram subway in Holborn will offer tours for a couple of months this summer.

The subway is one of those parts of London's disused transport network hidden in plain sight, as the slope that runs down to the tunnel is easily seen from Southampton Row to the north of Holborn. From there, it dips down to the tunnel, which once included a dedicated underground stop for the trams next to Holborn tube station, then down to the Embankment where it popped out under Waterloo Bridge.

Completed in 1908, the tramway was large enough to handle single height trams, but later demand for double-decker trams meant the tunnels had to be substantially altered in 1929. Initially very popular, trams were being replaced with buses and cars, and the last trams in London ran on 5th July 1952 – nearly 70 years ago.

After closure, the Kingsway subway was used to store trams for a while, then in 1958, the southern end was converted into a road tunnel, and another part for flood defence controls. The rest of the tramway has sat there untouched save by film crews, artists or for storage by the council.

In recent years it's been a very convenient site for Crossrail to use for access as the future Elizabeth line tunnels run very close by. It was returned back to its pre-Crossrail state in 2018, and last year, the London Transport Museum was able to run tours for a few weeks. Now, the Museum will be starting tours of the tunnels again, in June and July 2022.

Holborn tram station. Photo Nick Catford

The tunnel is tall, long and straight, with the original stone setts and tracks intact. Although most of the "station heritage" is from modern film sets, as a place to visit, it's pretty high up the bucket list for most people who have ever read about it – if only because it's so rarely open. It's also unlike any of the other Hidden London tours as unlike tube stations, the tram tunnels are huge to allow for the double-decker trams, so it's a totally different experience.

Sub Britters might remember a special open day in 2008 when seventy members were allowed into the tunnel by Camden Council for an unguided tour. Tours last around an hour and cost £46.50 per person. Tickets can be booked through the London Transport Museum website.

SOURCE: Ian Visits website

Museum of London closure announced

The Museum of London's London Wall site will close at the end of this year in preparation for its relocation to Smithfield Market (GLIAS Newsletter 286). The public will not be able to see the collections for about three years until it reopens in 2025 or 2026. The Museum of London Docklands will remain open to visitors during the move. From this June a final series of events, activities and displays at the existing Museum of London site are planned, celebrating the museum's successes over the past 45 years.The new museum at ground-floor level will 'retain the feel of the old Smithfield marketplace' while much of The London Collection will be displayed in an underground gallery space through which the Thameslink trainline will pass.

SOURCE: GLIAS Newsletter - April 2022

NEWS – HEALTH AND SAFETY

Cave rescue at St Margaret's Bay, Dover

Emergency crews used a ladder to rescue a group of people who became trapped in caves in Kent. The incident was reported at St Margaret's Bay, near Dover, at about 6.30pm on 22 January and attended by police, fire and ambulance crews.

There was no report of any injuries and the people rescued were left in the care of paramedics. The complex network of tunnels is in the cliffs above the bay. A Kent Fire & Rescue Service spokesman said: "Firefighters were called by Kent Police to reports of a group of people trapped in a cave in cliffs at St Margaret's Bay near Dover. After assessing the situation, crews were able to reach the cave using a 13.5 metre ladder and guide the group to safety.

There are no reports of any injuries, but South East Coast Ambulance Service was in attendance to check over the rescued people as a precaution."

SOURCE: *KentOnline,* 22 January 2022

Train crash inside the Fisherton tunnel, Salisbury, October 2021

Editor's note: In our last issue, *Subterranea* 58, we featured a news item about a collision between two trains as reported by the *Mail Onlin*e website. Unfortunately speculative parts of this account turned out to be misleading as shown by the following report.

Salisbury train crash caused by leaves left on track for 32 hours

The Salisbury rail crash happened after wet leaves were left on the line for 32 hours, a report has found. A cleaning train scheduled to hose the tracks down two hours before the accident was delayed because of engineering works. The findings come as the Rail Accident Investigation Branch released its interim report into the accident that left a train driver with severe injuries and 13 passengers in hospital.

The crash happened on October 31 last year when a South Western Railway train skidded on the tracks approaching a tunnel near Salisbury station in Wiltshire, and hit the side of a Great Western (GWR) service. The report said that on the day of the accident it had been raining heavily and the driver of the SWR train slowed its speed to avoid going through a red signal.

However, the train failed to slow sufficiently owing to the tracks being coated in wet leaves and continued to skid even when the driver applied the full brake. The SWR train struck the middle of the GWR service at around 56mph causing both to partially derail. The report said the SWR driver did not leave his cab until the last moment.

SOURCE: *Daily Telegraph*, 22 February 2022

NEWS – MILITARY AND DEFENCE

Breakin at Paddock bunker in north London

The former standby Cabinet war room in Brook Road, Dollis Hill, north London, usually referred to as Paddock, was closed to visitors in 2018 after the owner of the site, the Network Housing Group, withdrew funding and permission for Subterranea Britannica to run public tours of the bunker.

Sub Brit had run these popular tours on two days a year since 2001. Negotiations to restart the tours were underway until Covid struck. Nobody from Sub Brit has visited the bunker since 22 September 2018, the last public open day, and the door has remained locked.

On Saturday 19 March it was reported to Nick Catford that the bunker door was wide open. Andrew Smith drove there early on 20 March and found that the door was wide open and the lights were on. It was clear that the mortice lock had been drilled out in order to get into the bunker. An external padlock and hasp had been fitted so it would appear that the initial break-in was some time ago and Network Housing were aware and fitted a new padlock to secure the bunker. This padlock was quickly jemmied off to once more regain access. Andrew Smith took photographs, closed the door but didn't venture inside.

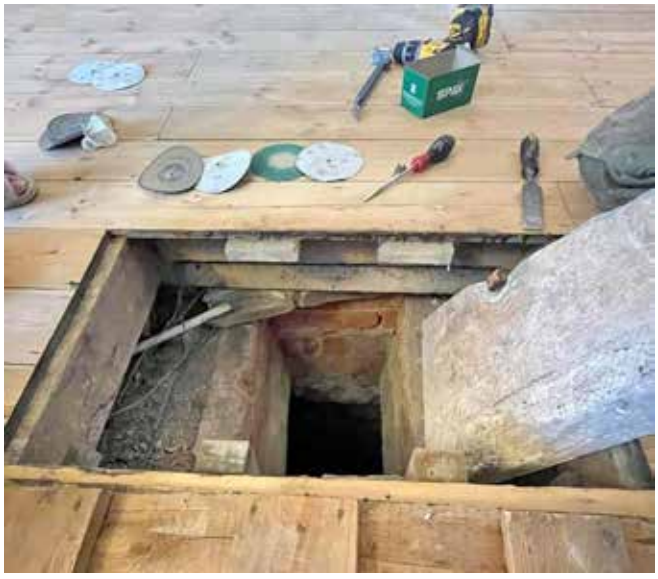
Later on 20 March Nick Catford contacted Colin Conboy,

the health and safety officer from Network Homes, and informed him of the break-in. A contractor was employed to fit a temporary lock later that day (a Sunday) and Mr Conboy assured Nick that Network's own maintenance staff would visit the bunker during the next week to make sure the site is secure. Nick Catford visited the Bunker 17 April and the door is now securely locked.

SOURCE: Nick Catford

Hidden chamber found under Herefordshire hotel

Owners of the seventeenth-century Glewstone Court country house hotel, in Ross-on-Wye, have found a hidden chamber under floorboards in one of its rooms. The floors of the listed building, which was built for wealthy landowner Charles Ballinger, were being restored by Exquisite Woods Ltd when the surprise discovery was made in the morning room.



Gary and Karen Homewood said guests have talked of their time as evacuees at the house during the Second World War. Mr Homewood said: "We were absolutely delighted to finally discover the infamous 'air-raid

shelter' which had been a topic of conversation since we arrived at Glewstone Court eight years ago."

In the coming months, the Homewoods want to explore it further and hopefully unveil some clues as to its era, purpose and use.

SOURCE: *Hereford Times,* 21 March 2022

Brislington war room to be converted to offices

Plans to transform a former Government building in south Bristol into new homes and offices have been given the green light.

Property firm Telereal Trillium was granted planning permission by the City Council to redevelop the old Department for Work and Pensions offices and driving test centre in Brislington into a new mixed neighbourhood. The site on Flowers Hill, which was vacated in early 2021, will include 160 new homes including affordable housing, a children's play area and open green spaces.

The site also includes a former nuclear bunker, the Bristol Regional War Room, which has been abandoned for a number of years. Built in 1953 underneath the Grade II listed building, it was designed to withstand the fallout from an atomic bomb.

By 1982 the bunker was in possession of Bristol City Council. In that year they rather grudgingly participated in the nation-wide Home Office 'Square Leg' civil defence exercise. After completion of the exercise the bunker was abandoned with all the 'Square Leg' paraphernalia still in place. The bunker is now the best preserved of the thirteen regional war rooms and is largely still in original condition with its two-level map room intact.

The map room. Photo Nick Catford

According to Telereal Trillium, the approval will allow the War Room to be reused for commercial business or community use, while preserving its historical interest. The developers are also planning to build a pedestrian and cycle link between Flowers Hill and Hungerford Road and make a financial contribution to public transport improvements, including funds for the construction of an outbound bus lane on the A4 Bath Road.

SOURCE: *Business Live,* 21 March 2022

Putin has moved family to secret Siberian nuclear bunker

Vladimir Putin, the President of Russia, has moved his family to a secret bunker in the Altai Mountains while war with Ukraine rages, according to Professor Valery Solovey.

Apparently the Russian president has hidden his family away in a luxury hi-tech bunker likened to an "underground city". It is said to be buried beneath a sprawling estate in the Altayskoye Podvorie resort in the Altai Mountains.

Professor Solovey is a former employee of the Moscow State Institute of International Relations and has previously alleged that Putin suffers from hidden medical problems.

SOURCE: *Mirror*, 1 March 2022

Cold War bunker in Cardiff given listed status

A Cold War-era nuclear bunker in Cardiff has been given Grade II listed status, it has been announced. Cadw said the Llandaff Sub-Control Centre was a sobering reminder of how close Wales came to nuclear annihilation in the 20th century. The single-storey windowless building was one of two sub-control centres in the city, as well as a Civil Defence Control Centre on Allensbank Road.

The building is on the outer edge of the gardens of Insole Court, a Victorian mansion which was an emergency service centre during the Cardiff Blitz. As tensions mounted after the war, the Civil Defence Corps (CDC) was revived across the UK in 1948, leading to Cardiff council to make plans for a possible World War Three.

Surveyor EC Roberts then built the control centre on Allensbank Road, in the Heath area of the city, and the two sub-control centres, in Llandaff and Cyncoed, in the 1950s. The Llandaff building is the only one which is still standing. Inside the bunker are the remains of ventilation systems, electricity generators and steel bunk beds in separate rooms for men and women in the CDC.

The control centre, message rooms and liaison officers' rooms were linked via messenger hatches, while there were also hidden escape hatches leading outside. The CDC was disbanded in 1968, but responded to several emergencies before then, including the Aberfan disaster,

Signals room in 2002. Photo Nick Catford

Signals room now

and volunteers kept emergency supplies there until the end of the Cold War in the early 1990s.

The control room in 2002 with the Welsh Red Dragon displayed on the wall. The room has been trashed and the dragon stolen

Editor's note: It is a great shame that Cadw has taken so long to list the bunker. When visited by members of Sub Brit in 2002 the bunker was locked and in excellent condition. The civil defence store room was stacked with equipment. Our guide said we could take anything we wanted but we decided to take one small item each as we felt everything should be left in place for others to visit and enjoy. Unfortunately some years later the bunker was broken into by urban explorers who fitted a new padlock so they could go back day after day to empty the bunker of original equipment and stores. Most of what was stolen ended up on eBay. All the rooms have now been trashed.

SOURCE: BBC News Wales, 3 February 2020

Metropolitan Water Board bunker in London for sale

Unique Estates are pleased to offer this exceptional and unique 2-bed apartment with its own garden and a large underground bunker. This property must be seen to fully appreciate it and benefits from being within walking distance to Angel underground station; Art Deco building, high ceilings, bright living space, modern fitted kitchen with integrated appliances, 2 double bedrooms.

The underground bunker is very spacious and has been fully refurbished as usable space with its own ventilation system, heating and lighting, possibly good for a home office, gym, music room or a safe house. 982 years remaining lease and available for viewings now, chain free. £800,000.

SOURCE: Zoopla

US Atlas missile silo for sale

An underground nuclear bunker that was the site of a missile launch facility during the Cold War is up for sale in Kansas for $380,000 – a relative bargain considering that the structure cost millions to build.

The property, located in Abilene, Kansas, is the site of a decommissioned Atlas-F intercontinental ballistic missile silo complex from the 60s, which has since fallen into some serious disrepair. Built in 1961 on 11 acres of land, it includes a Quonset hut with water and electricity, a one-building room for storage, and an underground complex designed to withstand a nuclear strike.

The underground complex spreads over two inhabitable levels, which were once used as a launch control centre and living quarters for crew during the Cold War. The site is known officially as 550th SMS Site 2 and was decommissioned on June 25, 1965, about four years after its construction. At the time, according to a website dedicated to Atlas Missile Silos, an underground structure like this cost about $15 million to build – or about $141 million in today's dollars.

The bunker is entered through a concrete block with a staircase. The main bunker is about 170 feet underground, and was reportedly constructed from concrete, epoxy resin, and 600 tons of steel rebar. It was designed to withstand a nuclear strike, as well as 500 mph winds – an asset against the tornadoes of Kansas. It's outfitted with water, electricity, and a forced sewage system to

the ground surface, providing a safe haven in the event of a nuclear bomb.

The underground structure is made up of two floors measuring 1,200 square feet each, and houses the launch control centre, as well as living quarters for the five-man crew that worked there in the 60s. That crew would have included an electrical power production technician, a missile maintenance technician, a missile facilities technician, a missile combat crew commander, and a deputy missile combat crew commander. Other crew could be stationed in the Quonset hut.

SOURCE: *MailOnline,* 22 February 2022

NEWS – MINES AND MINING

The reopening of Cornwall's South Crofty mine moves a step closer

Cornish Metals Inc has signed important land, mineral and waste disposal deals which will enable it to move ahead with its plans to mine copper and tin at the site. The company, formerly known as Strongbow, has reached an agreement with Brownfield Investments Ltd and Roskear Minerals LLP to lease a 1.2-hectare site surrounding New Roskear Shaft in Camborne for up to 23 years.

An agreement has also been reached to lease the mineral rights owned by Roskear Minerals within the South Crofty Underground Permission Area for up to 25 years. And a binding heads of terms has been agreed with Wheal Jane Ltd for the disposal of waste material derived from the treatment of mine water from South Crofty Mine into the Wheal Jane tailings dam 12km east of South Crofty. The agreement will become effective when dewatering of South Crofty commences.

Richard Williams, chief executive of Cornish Metals, said: "The agreements with Roskear Minerals, Brownfield Investments and Wheal Jane are important steps towards the redevelopment of South Crofty Mine, a strategic asset for the company.

"Our agreement with Roskear Minerals enables Cornish Metals to explore and develop the mineral resources that are contained in the Roskear section of South Crofty. During the 1980s and 1990s, much of the ore mined from South Crofty came from this part of the mine, and it is considered by the company to be a key area for delineation of additional mineral resources."

The agreement with Brownfield Investments and Roskear Minerals secures access to the New Roskear Shaft, a 650-metre deep, six-metre diameter, vertical shaft in the centre of Camborne, which is important for ventilation and access to South Crofty. Cornish Metals, a Canadian mineral exploration and development company, completed the acquisition of the South Crofty tin and United Downs coppertin projects, plus additional mineral rights in Cornwall, in July 2016.

Since acquiring the project, Vancouver-headquartered Cornish Metals has surveyed the vast archive of historical production data and more recent drilling data completed between 2007 and 2013.

Cornish metals drilling at South Crofty

In 2017, Cornish Metals completed a preliminary economic assessment that demonstrated the economic viability of reopening the mine. The firm has also undertaken extensive pilot-scale water treatment trials and successfully applied for and received the necessary environmental permits to abstract, treat and discharge mine water in order to dewater the mine.

Planning permissions for the operation of the mine and redevelopment of the surface facilities have been secured and construction of the water treatment plant foundations commenced. The dewatering pumps, variable speed drives and new high-voltage power supply have been delivered to site.

SOURCE: *Business Live,* 9 March 2022

Britain's only fracking company gets a one-year reprieve

The only firm to frack for shale gas in Britain could be offered a year-long reprieve for two of its wells. Cuadrilla was told by the Oil and Gas Authority (OGA) in February to permanently seal the wells drilled near Blackpool by June 30.

But on 15 March the regulator wrote to Cuadrilla asking them to confirm if they want an extension. It is the second time the OGA has approached the energy company regarding an extension, but Cuadrilla has so far declined – urging the Government to reverse the order instead.

A moratorium on fracking – where liquid is pumped underground to fracture shale rock – was announced in 2019, but there have been calls for a U-turn amid

soaring energy prices and the war in Ukraine. Fracking, or hydraulic fracturing, is a process in which liquid is pumped deep underground at high pressure to fracture shale rock and release gas or oil trapped within it.

It has been mired in controversy since 2011 after it caused two minor earthquakes in Lancashire, prompting a temporary ban on fracking in the UK. That was later lifted, but in 2019 the Government announced a moratorium on shale gas extraction – a few months after a tremor measuring 2.9 on the Richter scale was recorded at the Preston New Road site.

Business Secretary Kwasi Kwarteng now says that it 'didn't necessarily make any sense' to concrete over the wells in Lancashire as planned. Business Minister Greg Hands said that the Government has 'always been clear that the development of shale gas in the UK must be safe and cause minimal disruption and damage to those living and working nearby sites'.

SOURCE: *MailOnline,* 16 March 2022

New mining exploration in Blackcraig, Galloway, worries local residents

Residents in an area of rural Galloway started noticing some unusual activity near their homes late last year. Exploration work was beginning to see if there was a prospect of bringing mining to the area.

Its history of producing high grade zinc, lead and silver prompted the drilling. The company behind it said its work is "very low impact" but people in the area have voiced concerns it could "ruin the landscape" in the long term. JDH Exploration – a subsidiary of Australian company Walkabout Resources – is carrying out early-stage mineral exploration across Galloway and the Glenkens. One area it is looking at is Blackcraig where small-scale mining took place in the mid-1700s.

JDH said its drilling work had now concluded and samples were being sent to a laboratory to be analysed – a process expected to take several months. It said in a statement: "The drilling site had a footprint of only 10m by 10m and no toxic chemicals were used. Water used in the process has been entirely stored for safe disposal at an offsite location to ensure it doesn't enter the local ecosystem and the drill holes will be entirely rehabilitated."

JDH Exploration is looking for a "commercially economic resource" – but it does not look like a verdict is happening any time soon as decision about any viable mining is a number of years away.

SOURCE: *BBC News Scotland*, 20 March 2020

Runaway mine train in Australia

An iron-ore train owned by Anglo-Australian multinational BHP (formerly BHP Billiton) travelled for 57 miles through the outback in the Pilbara region of Western Australia without a driver on 5 November 2018.

It is claimed that the driver alighted from the locomotive to inspect a wagon. While he was out of the cab the train started to move away and the driver was unable to get back aboard. In a scene reminiscent of a Hollywood film, the 268-wagon freight train travelled for over 50 minutes without its driver at an average speed of 68mph through a sparsely populated region on the company's own tracks.

Mangled wreck of the derailed train

The train had been travelling from the BHP Newman mine northwards to Port Hedland. To stop the runaway the company deliberately derailed the train remotely from Perth about 75m from its destination near Turner. Nobody was injured when it was derailed, but the train and a one-mile section of track have been damaged. The mining company has temporarily suspended its rail operations and believes it could take a week to repair the track.

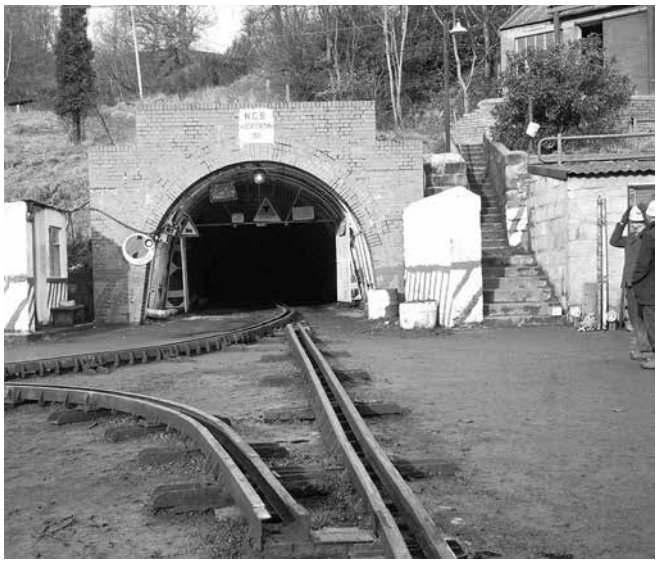
Interestingly, in July 2018 rival company Rio Tinto said it had become the world's first mining company to complete a heavy freight journey using new driverless train technology.

SOURCE: *Below*, Journal of the Shropshire Caving and Mining Club, Winter 2018

Aberpergwm Colliery to remain open

Operator Energybuild has said that its Aberpergwm colliery has been given permission to continue to mine 40 million tons of coal over the next 18 years, to the annoyance of Labour and Green Party politicians. The colliery currently provides coal to nearby Tata Steel in Port Talbot. It is the only producer of high-grade anthracite in Westem Europe.

Welsh ministers wanted the UK government to cancel the licence for Aberpergwm mine, near Glynneath in the Vale of Neath. The Welsh government said it was now "committed to working" with the company on business models that were sustainable. Energybuild said its products were "in significant demand to support the transition to a sustainable green economy". It provided 160 well-paid jobs in the area, plus l6 apprenticeships and brought "more than £l00m of investment" into the area.



Aberpergwm drift mine entrance

Caroline Lucas (Green Party), MP for Brighton Pavilion, said: "It is unbelievable and utterly shameful, especially when the UK still retains the presidency of UN climate change body COP." She called the awarding of the licence "retrograde and damaging. It's made worse by the farcical dispute between the UK and Welsh governments over who has the power to cancel the licence."

Aberpergwm was originally granted a licence to mine coal before licensing powers were handed to the Welsh movement. The mine operators had applied to the Coal Authority for formal recognition that the conditions attached to their original licence have been fulfilled. The Coal Authority website now says it has approved an application made in 2020 for a "full underground licence".

SOURCE: *Below,* Journal of the Shropshire Cave and Mine Society, Spring 2022

Sink hole in Welsh rugby pitch is a mine shaft

Work to repair a sink hole on a Blaenau Gwent rugby pitch was well underway in early April after a 70m-deep mine shaft was uncovered on the popular playing field. Banna Park, which is home to Nantyglo RFC, has been fenced off in recent weeks while investigations by the local council and the Coal Authority were underway to discover the cause of a sink hole that appeared near the try-line.

It was later discovered that the disturbance was part of a former mine shaft that stretched more than 70m deep, though work has now begun to fill the shaft ahead of next season. Russel Davies is the chairman of Nantyglo RFC and says the news of the repairs was a great relief to everyone in the community who will look forward to using the field again when it has been fixed.

He said: "Obviously we were very shocked when we heard about the sink hole a few weeks back and we were also very worried about the ramifications it could have on the club and the wider community. It was a great relief to hear that the investigations had been completed and that they had begun the repairs, as the field means so much to people because it is so well used.

"They've built a road on to the Banna park near the disturbance by the try-line, and after digging out a large section at the Brynmawr end have begun to fill it in with more than 2,000 tons of spark-proof stone. When the workers from the coal board saw how deep it went at over 70m their jaws just dropped and so did ours.

"It's crazy to think that was underneath the park the whole time just gradually being washed away by the rain. We won't be playing on there for the rest of the season now as the work is being carried out, but we are hopeful to be back for the beginning of next season. We are currently playing on Brynmawr school field so we have to say a big thank you to them for having us, as well as to the local council and Coal Authority for working around the clock to get this sorted."

SOURCE: *Wales Online,* 30 March 2022

NEWS – MISCELLANEOUS

Urban farmers bring the champignon back to the City of Light

The French call them "*champignons de Paris*" yet the farming of button mushrooms, the world's most commonly cultivated variety, had totally died out in the French capital – until now. After an absence of almost a century, a pair of green-fingered "urban farmers" in their 30s have reintroduced the fungi, growing *Agaricus bisporus* in a dark converted underground car park in the city.

French farmers revolutionised mushroom production two centuries ago by introducing the *champignon* to disused limestone quarries. They found that the mushrooms would grow year-round if placed in a manure-based substrate deep underground, where constant dark, temperature and humidity offered perfect conditions for their growth. Even the Paris catacombs, now a top tourist attraction, were once filled with mushrooms.

However, urban expansion, and above all the construction of the Paris metro, pushed growers out of the capital in the early 1900s with some moving into quarries in the suburbs and most decamping to the wine-growing Loire area. For the past two months, though, they have once again been growing beneath the city centre – not in a quarry but in a 2,500 sq metre former car park, just a 15-minute bike ride from Montmartre.

"This is the first time since around the 1930s that *champignons de Paris* have been farmed inside the city walls," said Jean-Noël Gertz, who runs the organic "urban farm" company Cycloponics, along with business partner Théo Champagnat. When at full capacity they aim to produce 2.5 tons every day.

"Our success is linked to the very high demand for organic, local products, a sector that is experiencing double-digit growth. We are riding that wave," said Mr Gertz. "We only grow the brown variety, because it's much richer taste-wise and the white button mushroom has been genetically modified beyond recognition in the past 30 years."

SOURCE: *Sunday Telegraph,* 26 December 2021

Yorkshire venue for NAMHO 2022

NAMHO 2022 will be hosted by the Cleveland Mining Heritage Society and take place in Grosmont, North Yorkshire from Friday 17th to Monday 20th June 2022.

Organised accommodation will be exclusive use of the Holme House Residential Centre and Campsite (normally a Girl Guide facility) at the nearby hamlet of Esk Valley, 1km walk from Grosmont along a footpath at the side of the heritage railway. We intend to provide camping for £15 per night and bunks for £20 per night including breakfast. The downstairs bunkhouse toilets, showers, kitchen and lounge will be available to the campers.

We hope most people will be able to stay here and make the short commute to the lecture venue on foot, rather than attempting to drive/park in Grosmont itself which can be extremely busy on weekends due to steam buffs. Parking costs £5 per day.

Unfortunately, we are NOT able to allow camper vans / caravans at the Holme House site; currently we are planning for them to stay in a car park in Grosmont, which is likely to incur the £5 per day fee.

If these arrangements suit you, you can book through the NAMHO website

www.namho.org/conf2022/confpages/conf_home.php

However, for those who don't enjoy the camping experience, are unable to make the 1km walk, or would simply prefer to go elsewhere, we recommend you start to make your own arrangements very soon. Staycations look set to be popular again in 2022 and the Grosmont area is a tourist hotspot.

The surrounding villages offer some B&B / AirBNB / Holiday rentals; however Whitby is the only sizeable town nearby, with numerous B&Bs, hotels and caravan parks, this is approximately 20 minutes drive or train ride away.

One of the easy underground trips is Coate Moor ironstone mine

Facilities at Holme House include:

Large dormitory sleeping 24 in bunk beds

Two bedrooms, each with twin beds and wash hand basins

Fully equipped stainless-steel kitchen with 6 burner large cooker, microwave, and boiler

Separate area for food storage. Fridge and freezer. Pot and pans, cutlery and crockery

Dining room with benches and tables, Activity room with chairs and foldaway tables

Lounge area with low seating and tables

Two toilets with wash hand basins downstairs, plus four shower cubicles

Not provided – sleeping bags, pillows, towels, toilet rolls and cleaning materials

Camping facilities include:

Enclosed campsite adjacent to house. Open fires allowed but no turfing

Use of downstairs Bunk House facilities such as kitchen, dining room, lounge

Barn available with fridge-freezer, tables and chairs

Single outside toilet with wash hand basin

No trailer tents, campers, caravans or dogs allowed.

SOURCE: Mike Moore

Buckingham Palace tube station to open to the public

It's been announced that the until now a secretive tube station built underneath Buckingham Palace is to be opened this summer for people to visit as part of the Platinum Jubilee celebrations.

The tube station was built at the height of the Cold War as part of a longer emergency escape railway built for the government and runs between the former government bunker at Marsham Street in Whitehall to a junction with the Piccadilly line at Green Park.

Commissioned by the Chief of Staff, General Birdcage in 1958, it's understood to be a single-track tunnel, with a terminus at the Rotundas bunker in Whitehall, and stations at Wellington Barracks and at Buckingham Palace. Construction was led by the Earl Marsham of Street, whose background in mining and family motto of *Stulti vadunt eo quo angeli verentur ingredi* (Google translate: *Fools go because the angels are afraid to go*) seemed apt to lead the construction of this tunnel. It took four years to hand-dig the tunnel and the spoil was used to landscape parts of Hyde Park near Marble Arch, giving the area the distinctive mound that it has today.

The stations themselves are just small halts, and it's expected that just a short 2-car shuttle train would have been used on the line. The shuttle train was run monthly down the line to keep drivers refreshed and the tracks in good working order until the line was decommissioned due to the declining threat of the Cold War and practical realities that it wasn't much use anyway. The last driver to run a test train along the tracks was G Orwell on 1st April 1984.

Although details were secret, they were declassified earlier this year, along with an unexpected photo of The Queen at the station, and this gave researchers their first chance to map the long-rumoured rail line.

One of the more unexpected revelations was that the top of the Victoria Memorial outside the front of Buckingham Palace is a ventilation shaft for the railway tunnel underneath, having reportedly been designed for a planned public car park that was to go under the front of the Palace courtyard but was never built.

Only the station at Buckingham Palace is being opened to the public, as the Rotunda 1 site was filled in when the Home Office building was constructed, and the Wellington Barracks station is still inside an active military site.

As a practical solution to removing the Head of State and other government ministers from London, the plan was fatally flawed though, as was swiftly realised after it was built. If there were to be an attack on London, it would be impossible to seal off the rest of the Piccadilly line for an evacuation train, and the last thing you want is a private train carrying the Queen being held up on platforms in the midst of an attack.

In practice, helicopters turned out to be a far more viable alternative, especially as they could land in Buckingham Palace's garden and take people to RAF Northolt, which is a far more sensible place to evacuate the government should the need arise.

The tube tunnel was never used and the tracks were removed in the 1990s, and it passed into legend about the many secret tunnels reputed to have been dug under London during the Cold War. This summer though, people will be invited to visit the small station under Buckingham Palace for the first time, with details to be announced shortly.

SOURCE: *Ian Visits* website, 1 April 2022. THIS WAS, OF COURSE, APRIL FOOL'S DAY.

Turkmenistan's leader wants 50-year-old Soviet fire to be extinguished

Turkmenistan's strongman leader has ordered experts to find a way to finally extinguish a massive five-decade-old fire in a giant natural gas crater, labelled the "gateway to hell".

Gurbanguly Berdimuhamedov, president of the central Asian country, appeared on state television in January, telling officials to put out the flames at the Darvaza gas crater in the middle of the vast Karakum desert. He cited environmental and economic concerns. In 2010, Berdimuhamedov also ordered experts to find a way to put out the flames, which have been burning since a Soviet drilling operation went awry in 1971.

The president said the human-made crater "negatively

affects both the environment and the health of the people living nearby. We are losing valuable natural resources for which we could get significant profits and use them for improving the well-being of our people," he said.

Berdimuhamedov instructed officials to "find a solution to extinguish the fire". The crater was created in 1971 during a Soviet drilling accident that hit a gas cavern, causing the drilling rig to fall in and the earth to collapse underneath it. To prevent the dangerous fumes from spreading, the Soviets decided to burn off the gas by setting it on fire.

The pit has been ablaze ever since and previous attempts to put it out have been unsuccessful. The resulting crater – 70 metres wide and 20 metres deep – is a popular tourist attraction in the ex-Soviet country. In 2018, the president officially renamed it the "Shining of Karakum".

SOURCE: *The Guardian,* 8 January 2022

Homes in Cornwall rocked by mini-earthquake

In early March hundreds of homes near the Eden Project in Cornwall were rocked by a mini-earthquake caused by a geothermal drilling site. Residents close to the Cornwall visitor attraction said it sounded 'like a bomb had gone off' before their houses shook. No major damage was reported following the 1.6 magnitude tremor but all operations at the geothermal drilling site have been temporarily suspended pending an investigation.

The company, set up by the Eden Project to provide heat to the famous 'biome' greenhouses and local community, confirmed the explosion was down to them and apologised 'for any disturbance'. Eden Geothermal halted its operations using its well, nearly 3.3 miles into the Earth's core, until 'additional mitigation controls are put in place'.

According to the British Geological Survey, seismic activity also due to the company occurred on 5 March and 23 January at Bodelva. An investigation and analysis of seismic monitoring data have confirmed that the event was linked to testing operations at Eden Geothermal.

Gus Grand from Eden Geothermal clarified that it was not drilling but workers injecting water into the earth's core in tests the company is running that causes the earthquake. The company hasn't been drilling since mid-November, but they are injecting water into the ground to see how permeable it is and this is associated with tiny seismic activity. They have been doing this since January

Eden Geothermal facility

and we've had a lot of very small events which is great because it shows us where the permeability is in the rock so in the future they can generate electricity from it.

The company said, "The event in March was just a little bit bigger than the others we've been having, it had 1.6 magnitude which is very common in the UK; we're not talking about anything that should cause anybody any worry which is why we put out a statement and stopped pumping for the moment."

SOURCE: *MailOnline,* 10 March 2022

Huge ice house found under London street

For the well to-do residents of Georgian London, serving chilled drinks at a festive party was a more complicated process than today. In the absence of electricity to make ice cubes and keep them frozen, they had to source their ice from elsewhere. For the most discerning hosts, that meant using blocks of purest frozen Norwegian lake, which was shipped to London's docks and then carefully stored until required to be chipped into glasses and clinked.

Archaeologists have now uncovered a link to the capital's lost ice trade with the rediscovery, under one of London's most prestigious addresses, of an enormous 18th-century ice store, the existence of which had been almost entirely forgotten. The cavernous subterranean structure was built in the 1780s just to the south of Regent's Park and is the earliest-known, large-scale commercial ice store, which has led to it being designated a scheduled monument by Historic England. There are plans to make it accessible to the public, once the development is completed, on certain dates during the year.

The store, sometimes called an ice well or ice house, was excavated in 2018 by archaeologists working on a new development of Park Crescent West, the grand stucco terrace built on the site by John Nash, the architect of Buckingham Palace, 40 years after the ice store was constructed.

"There was always an understanding that there was an ice house here somewhere, but we weren't sure where," says David Sorapure, the head of built heritage at Museum of London Archaeology which has been working on the site with developers Great Marlborough Estates. "Even after we discovered where the entrance was, we weren't quite sure how big it was, or how you got in."

The egg-shaped cavern, 9.5 metres deep and 7.5 metres wide, had been backfilled with demolition rubble after the terrace was bombed during the war, requiring three months of careful excavation before its structure could be fully revealed. Once cleared, it revealed a wonderfully preserved brick void, built to a much higher standard than the stately stucco terraces that surround it, according to Sorapure, and still structurally secure, even as the Jubilee line thunders less than 10 metres beneath it.

The store really came into its own in the 1820s, when the pioneering ice merchant and confectioner William Leftwich began importing high-quality ice from Norway for the first time. In 1822, he chartered a vessel that brought 300 tonnes of frozen lake, which he transported up the new Regent's Canal to be lowered into the ice store through a small opening on top.

Workers would then climb down into the void from a small corridor near the top, to chip off blocks when required. Insulated with hay, these were then shipped by horse and cart to restaurants and private addresses and also, potentially, to some of the medical establishments nearby.

SOURCE: *The Guardian*, 28 December 2018

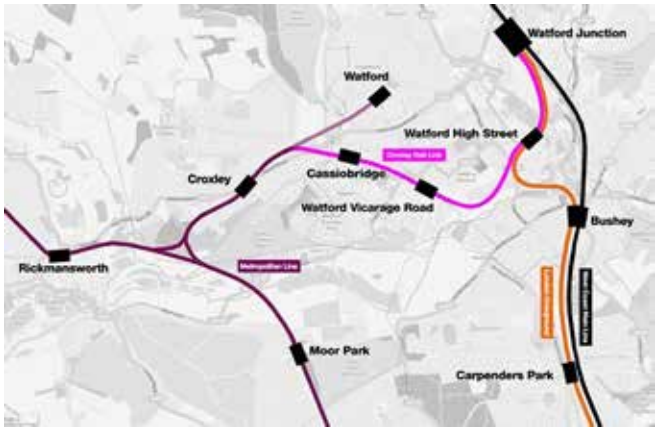
Metropolitan line extensions to Watford might be reprieved

Living close to a London Underground station is a priority for many people when choosing where to live in and around the capital. It can shave off a lot of time from your commute if you don't have a long walk or a bus journey to get to the Tube. And it's generally much easier if you can just nip around the corner and be on a Tube within minutes.

It's why the potential plans to build a new extension to the Metropolitan line could please a lot of people. Currently the line terminates in Aldgate at one end, and then in several places on the other side of the line, including Uxbridge, Amersham and Watford.

Now, the government is being asked to reconsider an extension to the line in Watford that was originally proposed back in 2016, known as the Croxley rail link. Plans were cancelled four years ago because the final costs around it were uncertain, but now the Three Rivers District Council, covering the area, will write to the Department for Transport asking for the £360 million needed for the work.

The plans propose closing Watford station, and building an extension which would go to Watford Junction instead, via a number of new stations. The spur of the line from Croxley to the current Watford station would be shut down.



This map shows the planned extension in bright pink

Instead, a little way beyond Croxley, the extension would go to a new station called Cassiobridge and a new station called Watford Vicarage Road. Then it would continue on, stopping at the already existing Watford High Street (also where the Overground stops) and then finally terminating at Watford Junction. So while one station would be closed down, the Metropolitan line would have four new stops on its route. It would mean a lot more people living in Watford would be within a closer walking distances of an Underground station.

SOURCE: *MyLondon*, 10 November 2021

New rolling stock for Glasgow Subway

Brand-new underground trains which will become the first in Britain to operate with no staff on board have made their first test runs on the Glasgow Subway.

It is due to be followed by full-scale trials from April, with the trains expected to start carrying passengers in 2023. They will replace trains that are now more than 40 years old as part of a £288.7 million overhaul of the 15-station circular railway. The upgrade will enable services to run more frequently, with open plan walk-through interiors replacing separate carriages, and passengers able to see along tunnels from windows at each end of the trains.

They are scheduled to initially operate with drivers before switching to "unattended train operation" like some

underground lines in Paris, Barcelona and Copenhagen. Drivers will remain on board until platform safety screen doors are fitted at stations, similar to those on some London Underground lines.

Several other UK metro systems run without drivers, such as the Docklands Light Railway in London, but have on-board staff to operate the doors. The trains may be introduced using existing Subway signalling while a new system is installed.

The trial took place while the system was closed overnight on Saturday 4 December. It was staged so the joint venture comprising Swiss train builders Stadler and signalling firm Hitachi could check the train could travel under its own power, running between the Subway's Broomloan depot and nearby Govan station.

The train was also attached to one of the Subway's "rescue" locomotives to check it could be retrieved in the event of a breakdown. SPT described the exercises as "very successful" and said planning was underway to begin intensive overnight testing of the new trains in the Subway.

SOURCE: *The Scotsman*, 17 December 2021

Bank Station upgrade

Deep under the streets of central London, huge tunnels have been dug to create a vastly transformed Bank tube station, and the first phase is due to open in May.

Away with narrow crowded platforms on the Northern line, and in with wide-open spaces. Away with cramped corridors and stairs to the Central line, and in with a moving walkway. Away with long walks between the street and platforms, and in with escalators and lifts direct from street to platform.

While people using Bank station would have been generally aware that something was going on thanks to all the construction hoardings, as so much of it was hidden from view, few can appreciate just how big the construction site has been. For those not using the station, most would have become aware of the Bank station project earlier this year when part of the Northern line passing through it closed, but that closure was just the final stage of a construction project that, after years of consultations, got underway back in 2016.

In essence, a brand-new southbound platform for the Northern line has been dug next to the station and the Northern line closure is to allow that new tunnel to be

New southbound platform on the Northern Line. Photo Ian Mansfield

connected up to the old tunnel. While that is going on, the old southbound platform is having its tracks filled in, and that tunnel is being turned into an expanded northbound platform. In addition, a new entrance being built on Cannon Street will provide escalators and lifts direct to the Northern line, and then down to the DLR – and a new tunnel will link the Northern and Central lines via the moving walkway.

On Cannon Street, a new station entrance box has been built and is now being fitted out internally. Down in the basements under the new entrance, around 100 rooms have been created to provide the back of house space that the station has needed for so long. Elsewhere, they've merged the London Underground and DLR control rooms to improve how the station works. But to get down to the tunnels, it takes eight flights of stairs down a newly-built fire escape to get to the Northern line platforms, and down here, a hive of activity is underway to finish off the work that's been ongoing since 2016.

In the past few weeks, what had been the old southbound platform has been totally transformed. The old railway tracks have been removed, and the space where the tracks were has been filled with a new smoke extraction system and then covered over. At the moment, it is just possible to see a line in the concrete where the old platform used to meet the tracks, but that will all vanish under the new floor tiles that are waiting to be laid to create a new passenger space.

This space will become an overflow for the existing northbound platform, and to enable that, they've been replacing the narrow doorways between the two platforms with wide new entrances. At the far end, you can still see the narrow stairs that people used to use to get onto the platforms.

What's replacing the old southbound platform is a huge new space with a new platform that is about three times wider than what people have been used to, and considerably taller, creating a vast almost impossibly large cathedral-sized space deep under the streets.

SOURCE: *Ian Visits* website, 29 March 2022

Radical plan to make Earth's deepest hole

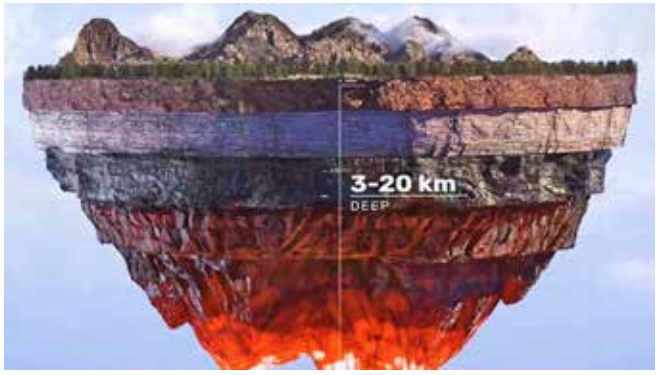
Since its launch in 2020, a pioneering energy company called Quaise has attracted some serious attention for its

audacious goal of diving further into Earth's crust than anybody has dug before. Following the closure of first round venture capital funding, the MIT spin-off has now raised a total of US$63 million: a respectable start that could potentially make geothermal power accessible to more populations around the world.

The company's vision for getting closer to the centre of the Earth is to combine conventional drilling methods with a megawatt-power flashlight inspired by the kind of technology that could one day make nuclear fusion energy possible. Geothermal energy has become the forgotten renewable. With solar and wind increasingly dominating the market of green energy, efforts to tap the vast reservoir of heat deep beneath our feet remain stubbornly well behind.

It's not hard to understand why. Despite being a perfectly good choice of clean, uninterrupted, limitless power, there are very few places where hot rocks suitable for geothermal energy extraction sit conveniently close to the surface. Quaise aims to change that by developing technology that will allow us to make holes in the crust to record depths.

To date our best efforts at chewing our way through the planet's skin have bottomed out at around 7.6 miles. While the Kola Superdeep Borehole and others like it may have reached their limit, though, they nonetheless represent amazing feats of engineering.



To push further, we'd need to find ways to grind away at material squeezed by dozens of kilometers of overhead rock, and then cart it back up to the surface. Digging tools would also need to still be able to grind rock at temperatures exceeding 180 degrees centigrade. Turning the drill bits over such a long distance would also need some clever thinking.

One potential alternative to the above obstacles is to drill less – and burn more. Born out of nuclear fusion research at MIT Plasma Science and Fusion Center, Quaise's solution is to use millimetre-long waves of electromagnetic radiation that force atoms to melt together.

Devices called gyrotrons can efficiently churn out continuous beams of electromagnetic radiation by shaking electrons at high speed inside powerful magnetic fields. By hooking a megawatt-power gyrotron up to the latest in cutting tools, Quaise expects to be able to blaze its way through the toughest, hottest rock, down to depths of around 12.4 miles, in a matter of months.

At these depths, the heat of the surrounding rock can hit temperatures of around 500 degrees centigrade – enough to transform any liquid water pumped down there into a vapour-like supercritical state that's perfect for generating electricity. Using its seed and investment funding, Quaise anticipates having field-deployable devices providing proof-of-concept operations within the next two years. If all goes well, it could have a working system producing power by 2026.

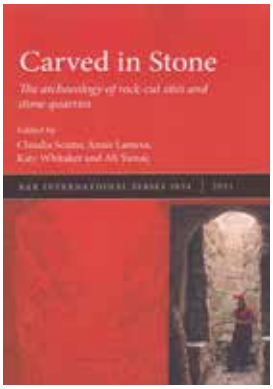
By 2028, the company hopes to be able to take over old coal-fuelled power stations, transforming them into facilities powered by steam instead.

SOURCE: *Science Alert,* 9 March 2022

NEWS – PUBLICATIONS & BOOK REVIEWS

Carved in Stone: The archaeology of rock-cut sites and stone quarries

SCIUTO Claudia, LAMESA Anaïs, WHITAKER Katy and YAMAÇ Ali, 2021, BAR Publishing, 181pp, £48, ISBN: 9781-40735-809-3



Book Review by Martin Dixon

This academic publication brings together a diverse mix of topics, covering the extraction of stone, the excavation of underground structures (for both the living and the dead) and how such structures were then utilised. It brings together many disciplines, including geology, quarrying techniques, ethnography and experimental archaeology, amongst others. The book arose from sessions of the European Association of Archaeologists and their welcome attention on these aspects of archaeological research.

The result is an intriguing mix of papers addressing sites that date from prehistory right through to the present day (in the case of the creation of a new rock-cut tomb in Indonesia and some experimental work in Sardinia). Most of the locations featured are European but as well as featuring Indonesia, sites in Ethiopia and China are also included. As is often the case, many of the sites give clues as to their construction and usage that has been lost in above-ground remains.

After an introductory chapter setting the context, the 12 papers include studies on wine cellars on the borders between the Christian and Islamic worlds in modern-

day Slovakia, the underground cities of Cappadocia and French sarcophagus quarries dating from the Middle Ages. Perhaps most familiar to Sub Brit readers will be the *souterrains* (underground refuges) built in France between the 10th and 16th centuries whose construction is described by Luc Stevens, past President of SFES (Société Française d'Etude des Souterrains) and a long-term associate of Sub Brit.

The papers are all in English and although only a couple of the authors have English as their first language, the translations and abstracts are generally excellent. In some academic publications, papers suffer from being inadequately illustrated but those in this volume have plentiful photographs, maps and diagrams to augment the text. I would have preferred however to have had more of the photographs reproduced in colour.

Despite the richness of our underground it is a pity that no UK sites feature in the book; perhaps this is a reflection of the relative lack of focus by our universities; hopefully something that will be rebalanced in future years. One of the editors (Katy Whitaker) is however a doctoral research student at the University of Reading and one co-author is a senior lecturer at the University of Edinburgh so it is pleasing to know that the UK has at least some involvement in the publication.

Much of earlier academic work on quarrying has focused on more 'exotic' products such as marble and granite; it is good to see more day to day building stones being featured (although purists might argue that plaster of Paris is mined rather than quarried). I would suggest that the statement that rock-cut sites "...only drew scholars' attention during the 21st century..." is somewhat of an exaggeration when sites like the Valley of the Kings, Petra and the aqueducts of Ancient Rome have been studied well before this.

Overall, it is very satisfying to see the topic of many of our passions being treated with respect (as opposed to the growing number of more sensationalist TV documentaries). In particular the common thread that underground excavation can teach us so much about the way our ancestors lived and died is particularly welcome. At £48, the book represents a significant outlay but perhaps libraries can source the book or online access to the extensive BAR catalogue.

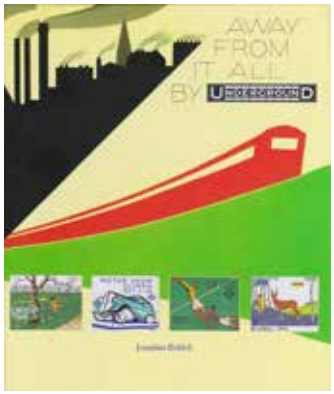
Away from it all by Underground

RIDDELL, Jonathan, 2021, Capital Transport Publishing, 128pp, £19.95, ISBN: 9781-85414-455-3

Book Review by Martin Dixon

Capital Transport specialises in producing books on the UK's transport system, particularly in and around London, many of them using material from the collection of the London Transport Museum. This latest volume follows that model and is a delight to anyone who has an interest in the use of promotional posters on the Underground.

Although a number of books have featured the larger



posters used on platforms and passageways, this book instead looks at the smaller posters which were used within the train carriages themselves to advertise London attractions and upcoming events. Known as 'car cards' or 'panel posters', they usually measured around 10 inches by 12. The posters were predominantly placed on the glass 'draught screens' by the doors of the train, rather than above the windows where most of today's adverts appear.

The posters were individually designed by a wide range of artists, building on Frank Pick's strong design ethic. Perhaps surprisingly, annual events usually had a completely different design each year which must have come at a cost. The commercial aim was to maximise passenger numbers outside peak rush hour periods, especially at weekends, when most of the system had spare capacity. Most of the images featured date from the interwar period.

The book starts with an introductory chapter, which helpfully includes some photographs of the posters in situ on Underground trains of both surface and tube stock. The following chapters then each feature a particular event or genre, arranged alphabetically from *Boat Race* to *Zoo*.

Some of these events such as the Chelsea Flower Show and Wimbledon's Tennis Championships are still as familiar today. Others such as the Hendon Air Show and Bushy Park's Chestnut Sunday have been lost over the years; the latter was apparently so well known at the time that its date (the nearest Sunday to 11 May) is not even mentioned in the posters from the 1930s that promote it.

Each chapter has a short introduction of its own and is followed by a selection of posters. In all, over one hundred posters are illustrated, each with a well-written and informative caption. As the originals were so much smaller than posters intended for platform display, much less is lost in the reduction in image size and the quality of reproduction is excellent. Some of the posters are reproduced against a background of period moquette fabric but to my eyes this distracts from the design and in the few places where text appears on the moquette it is more difficult to read.

Quite a number of the illustrations show interesting incorporation of the LT roundel into the design – although not always in line with the corporate design guidelines.

Many artists have several of their artworks featured, including the delightfully named Herry Perry; many of her posters feature a small pigeon wearing a hat somewhere in the detail. This includes one watching an RAF Display – perhaps my favourite topic for the posters.

Criticisms are few, but perhaps including a few examples of full-size posters for the same event would have been instructive in comparing the design treatment. An index of artists featured against their designs would have been helpful to make it easier to compare works by the same artist. And at almost £20 the book isn't cheap but, as mentioned, it is beautifully produced.

Inventive Vents – A Gazetteer of London's Ventilation Shafts

LAVERS, Lucy, Judy Ovens and Suzanna Prizeman; Editor Richard Duguid, 2021, Our Hut, 96pp, £12.50, ISBN: 9781-52729-817-0

Book Review by Stewart Wild

As all members know or will soon find out, Sub Brit's mission to study all aspects of man-made and man-used underground spaces encompasses an extremely wide range of structures at home and abroad. This range has now increased considerably with the publication of this well researched book covering aspects of our built environment that many of us had up until now paid scant regard to: underground ventilation space.

This book features a great variety of such structures but deals only with central London. It is to be hoped that renewed interest in this genre will encourage research into similar constructions in other cities far and wide. It sparked such interest among London members that in early March this year a guided sightseeing tour was organised aboard an iconic Routemaster double-decker to view a dozen or so of these inventive vents, unfortunately above ground only.

These portals to the underworld come in many surprising and interesting forms, and this superb gazetteer has managed to unearth and detail more than forty-five of them on both banks of the Thames. They range from chimneys disguised as statues to a Moorish pavilion ventilating a Victorian Turkish baths to perhaps the star of the show, the extraordinary 'Camberwell submarine', a boiler room vent in Akerman Road, SW9.

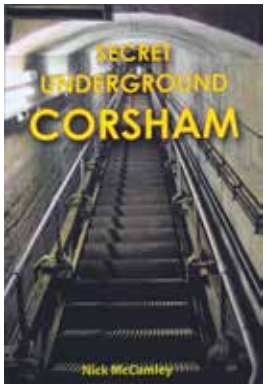
Other sites include obelisks and columns, a peculiar metal sculpture by Eduardo Paolozzi, the National Police Memorial, the Wellington Arch, stinkpipes, a steel and aluminium 'optic cloak' and a variety of shafts that ventilate tube lines. The Victoria line alone has fifteen vents along its length and a whole chapter gives their locations and details.

The book comes in a handy spiral-bound A5 size on sturdy 125gsm matt paper and starts with an introductory chapter and a short history of underground London, with maps. Principal sources, books and useful websites (including of course Sub Brit's), are given at the end. This is a useful addition to any member's bookshelf, and at £12.50 good value too. The publisher, Our Hut, is an architecture education charity.

Secret Underground Corsham

McCAMLEY, Nick, 2021, Folly Books, 230 pp, £15.00 ISBN: 9781-91617-894-6

Book review by Martin Dixon



Most Sub Brit members will be familiar with underground Corsham as the location of the standby central government headquarters during the Cold War. Known by various code names over the years, perhaps the best known is BURLINGTON (code names were always rendered in capital letters).

But the area's underground space had a rich history prior to this era, from original excavation as Bath Stone quarries, through a multiplicity of uses during World War II, including ammunition storage, underground factory and Operations Room for No 10 Group RAF Fighter Command. Today, most of the space lies empty although an extensive fine wine storage business operates from within Eastlays quarry.

Over the years, all these periods have been well documented by publications from Folly Books, including Derek Hawkins' *Bath Stone Quarries*, Nick McCamley's *Secret Underground Cities* and *Second World War Secret Bunkers* and Nick Catford's *Burlington*. The first and last of these volumes are currently out of print and, partially as a result, Folly Books has produced this current volume, being effectively a condensed omnibus of the earlier publications.

The book includes all the former quarries in the Corsham area and is profusely illustrated, with some historic images appearing as well as contemporary photos. Most

of the photos are by Derek Hawkins, with others by Nick Catford and Nick McCamley himself. The photographers are suitably acknowledged as major contributors to the work.

Each of the major quarries has a wartime plan included which is helpful in showing the vast areas under consideration. The Central Ammunition Depot within Tunnel quarry, for example, included ten districts, each occupying around five acres. In total around 120,000 tons of ammunition were stored here.

The well-researched and comprehensive text should satisfy all but the most ardent of readers. An introduction to the geology of the area and to mining techniques and transportation is included as a foundation. The majority of the book is then given over to the period of World War II.

One of my personal favourites – the (eight) former canteen areas of the wartime factories within Spring quarry – is given its own chapter. This is because of the magnificent murals that still decorate the walls which were painted by Olga Lehmann in the early 1940s and are justifiably Grade II* listed. Burlington (non-capitalised!) takes up 40 pages of the book and detailed plans of its Cold War layout are included.

The breadth of coverage, expertise of the author and quality of illustrations are particular strengths. The book is also superb value for money at just £15.

My main criticism is that the smaller format (235 x 156mm as against 245 x 245mm of the original volumes) means that some of the detail of the photos is lost and the plans in particular can be very difficult to decipher. As the volume is printed portrait-style, many of the pages carry two landscape images which perhaps exacerbates the issue.

More of the photos could ideally be dated and the opportunity to have 'now and then' images side-by-side would have added interest. The book also ends a little abruptly and a short postscript or reflection on the contribution made (or in the case of BURLINGTON, not made) by the quarries as a whole would have nicely rounded things off.

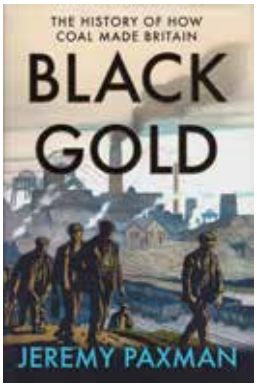
So roll on a full reprint of the more comprehensive Folly volumes but, in the meantime, at less than half the price of a single rail ticket to Bath, this gives a superb account of some simply fascinating sites.

Black Gold: The History of How Coal Made Britain

PAXMAN, Jeremy, 2021, William Collins, 392pp, £25.00, ISBN: 9780-00812-834-0

Book review by Martin Dixon

In these days of concern over climate change and carbon footprint, the use of coal as a fuel source is frowned upon. But without it, the industrial revolution would not have been possible. Not only industry, but transport, heating and lighting were all derived from coal for centuries. In the period before World War I, two-thirds of the world's coal came from the UK. In 1920 there were 1,191,000



coal miners in the country, and even in 1984 the total was 187,000. By 2018 the official figure had dropped to 590 and is no doubt even less than that today.

This volume tells the story of the dominance and decline of the UK's coal industry, primarily as a social history – a story full of privilege, protest and politics. It starts with the Romans but is mostly focused on the 18th to 20th centuries. It finishes with the miners' strike of 1984, the outcome of which some may regard as a victory but to others was an unmitigated catastrophe in so many communities.

To declare an interest, I was born and raised in Barnsley, at the heart of the South Yorkshire Coalfield; at school, more than half of my form had fathers who were miners. One of my grandfathers was a miner whilst the other worked on the estate of the Earl of Strafford, who had made a fortune out of the industry without ever venturing underground.

In comparative terms, Barnsley had large seams (up to nine feet high) which reduced the amount of crouching and crawling underground. But this was no solace when disaster struck, as it did in the Oaks Colliery in 1866 when an underground explosion killed 361 miners including a number of brave rescuers. This was, and remains, England's worst mining disaster.

Each chapter of the book has a theme, including the hardship of extraction, the fortunes that awaited fortunate landowners atop the coal measures, steam power, ship propulsion (particularly insightful), unionisation and the 'Bevan Boys'. The disasters that befell the industry (between 1873 and 1953 around 85,000 people were killed in mining accidents in Britain) and the way in which the conflict between management and workers led to the demise of UK mining permeate throughout the book. Some of this misery is balanced by more uplifting tales of mining communities and their galas, allotments and brass bands.

The book has a selection of fascinating illustrations and photos taken across the ages; many show the hardships for underground workers and the strikes, riots and conflicts that raged on the surface. There is a useful index and the fifteen pages of references show the depth of research behind the volume.

The researcher Jonny Ainslie is praised in the

acknowledgements but arguably deserves a more prominent credit. Other acknowledgements show that unions, management, politicians and academics have all been consulted in the production of the book. Only Arthur Scargill (approached but without response) is conspicuous by his absence.

On the downside, the book could usefully have included some maps showing the location of the major coalfields and although this is far from an engineering or geological treatise, perhaps some plans and cross sections would have added to the richness of the contents. The overall tone somehow comes across a little smugly at times and a more thorough proofreading would have removed some of the inconsistencies of dates and duplications. An occasional duplication is, however, preferable to omission.

Overall, to anyone enthralled and in awe of the achievements and anguish of our coal-mining forefathers, this is a fascinating and recommended publication.

National Treasures: Saving the Nation's Art in World War II

SHENTON Caroline, 2021, John Murray, 319pp, £16.99, ISBN: 9781-52938-743-8

Book Review by Martin Dixon

Caroline Shenton worked as an archivist, both at the National Archives and as the former Director of the Parliamentary Archives in London. This book takes a detailed look at the work of her predecessors in securing many of our museum and art collections through the dark days of World War II.

The Sub Brit interest comes from the fact that a number of the locations selected for their safe-keeping were of course underground. The focus of the book is on the decision-making and practicalities of protecting the masterpieces, with a particular emphasis on the personalities of the key players involved.

Many of the relocation sites were large country houses on distant estates thought to be relatively safe from enemy bombing. But the offers of space for our national collections were often far from altruistic. Many thought that by offering space for inanimate objects they would be spared the disruption of housing evacuated schools, hospitals or (worst of all) billeted soldiers.

But those inspecting suitable properties gave as good as they got. Assistant Keeper of the National Gallery Martin Davies said of one property, "*Owner not inspected, but seems obliging in a haughty way.*" What is impressive is that the process of selecting sites began within a week of the limitation of German political parties to the National Socialist Party on 14 July 1933.

In terms of underground sites featured, some of these are well known such as Manod Slate Quarry in north Wales where pictures from the National Gallery were stored (see *Subterranea* 57) and Aldwych tube tunnels (used by both the British Museum and Public Records Office), the Aldwych branch of the Piccadilly line from Holborn being closed for the duration of the war. Other subterranean destinations are less generally known, such as the Crown Jewel chambers beneath Windsor Castle (described in *Subterranea* 58) or the crypt of Gloucester Cathedral (destination of the Coronation Chair).

A few proposed locations never reached fruition, including the disused Brompton Road tube station, where the nearby Victoria and Albert Museum had plans (and a lease!) to utilise the empty access tunnels for storage. These plans were undone by the War Office's use of the site as a Gun Operations Room (erroneously described in the text as a 'telephone centre') which took precedence. Details of damage to museums and galleries suffered during wartime air raids is detailed, showing that all the efforts were far from in vain.

The book includes a small collection of twenty photos, although some of these are three to a page which makes the detail difficult to discern. The author has done extensive research into the archives of the establishments involved, as well as consulting the National Archives. There is a useful index and the source notes run to 27 pages, with an additional ten-page bibliography.

The characters of the key players are well described alongside their actions; for example in 1934 Kenneth Clark, Director of the National Gallery, opened the gallery at 8am to allow supporters attending the FA Cup Final to visit before the match; how times change!

On the downside, the prologue to the book perhaps introduces too much of the ethical debate about the sourcing of museum treasures than is relevant to a World War II narrative ("*Uncomfortable questions about the violent seizure of others' heritage to adorn our national institutions …*"). Collection details are very London-centric so those outside the capital or in other home nations may feel a little hard done by, though the National Library of Wales gets good coverage. More and larger photos would have been nice but a more obvious omission is of any maps or plans.

Some maps covering the location of the galleries and museums concerned would have been helpful and (particularly) a map showing the many relocation sites. Given the effort that has obviously gone into the research, I feel this would have been a straightforward addition. Similarly a plan showing the layout of some of the larger

storage sites (such as the 'Cathedral' at Manod and the ARP tunnel beneath the National Library of Wales) would add value.

Overall this is a well-written book covering a fascinating period when Britain strove to ensure that the seemingly inevitable conflict that became World War II did not put our irreplaceable heritage at risk.

The focus is not primarily on the details of the chosen subterranean refuges and for those for whom this is of primary interest then Nick McCamley's earlier work (*Saving Britain's Art Treasures*, Leo Cooper, 2003), referenced in the text, provides an alternative source.

NEWS – TUNNELS AND TUNNELLING

North River rail tunnel in New York is crumbling

A 110-year-old two-track rail tunnel beneath the Hudson River in New York which carries 200,000 people a day is crumbling. Between 2014 and 2018, major failures caused 65,000 minutes of train delays. That's roughly 45 days of commuters stuck on platforms, trains or facing a departure board full of cancellations.

Fixing the tunnel between New York and New Jersey has been dubbed one of the most important infrastructure projects in America. That's because these delays don't just impact New Yorkers. The tunnel is a bottleneck for America's busiest passenger railroad, from Boston to Washington D.C. When it fails, 20 percent of the nation's GDP gets put on hold. If just one track were to close, it could cost the nation $16 billion. Building a new tunnel sounds like the obvious solution. But first, engineers need the money and political will to get it done.

The state of the tunnel is clear to see

The North River Tunnel was built by the Pennsylvania Railroad in the early 1900s. At the time, working underground at such intense atmospheric pressure took a physical toll on the workers. And digging through soft, flowing mud made it difficult to establish a secure foundation for the tunnels. Long before tunnel boring machines, engineers used tunnel shields and compressed air to dig out a set of twin tunnels under the Hudson River.

The giant metal shields had a diameter of roughly 15 feet, with holes designed to let silt, clay, sand and gravel pass through as it was pushed through the soft ground. The air in the tunnel was pressurised, the walls were lined with concrete and they were reinforced by steel rods. Now, use of the commuter tunnel has grown substantially over the years, and natural wear and tear has set in.

In 2012, Hurricane Sandy hit. Subway stations right across New York City flooded, and the North River Tunnel is still reeling from the damage caused by the saltwater.

SOURCE: *B1M video channel,* 15 November 2021

Tours of Nottingham railway tunnels are stopped

More than 3,000 people have signed a petition calling for a disused Victorian rail tunnel beneath Nottingham to be opened once again for public tours. Local historian Janine Tanner had been running group visits until access was suddenly stopped, leading to a three-year battle with Nottingham City Council. The tunnel runs from beneath Victoria Centre to Weekday Cross. It was once part of the Great Central Railway and Nottingham Victoria Station, which was demolished in 1968.

Mrs Tanner ran three tours in 2018 after doing everything she'd been asked to do in terms of safety, including taking out public liability insurance, providing hi-vis jackets and first aiders. Each tour had thirty people. She said: "They were absolutely awestruck. They couldn't believe what they were looking at. You walk through from Victoria Centre car park and open the door and it's like walking into something from Harry Potter. It's this massive cavernous place that you can see has been there since Victorian times.

"There are so many railway relics down there. It took 18 months of persuading the council to allow the tours and in the end they said okay. They allowed me to do three tours and when I asked when I could do the fourth they said you're not doing it any more. The only answer they've really given me is: it's not in the council's interests any more to allow you in there."

One of the tours in the Victoria Railway Station tunnel. Photo Janine Tanner

Mrs Tanner even offered to pay the council £1,000 annually in return for four group visits a year. She said one of the major stumbling blocks had been changeovers in council staff so each time she contacted the local authority she ended up speaking to a different person.

After taking her plight to local MP Lilian Greenwood,

a Zoom meeting took place in 2020 when Mrs Tanner explained she had previously run tours. "They said they would sort out the paperwork. Between September 2020 and 2021 they have been telling me 'Yes I could go in' and they will sort out a date for me to start doing the tours again. Then the person I was in contact with left the council so I was back at square one."

Mrs Tanner was on the verge of giving up but she said other people had persuaded her to keep fighting on. Since launching the petition, Mrs Tanner has been told the council is hoping to organise a face-to-face meeting with her.

SOURCE: *Nottinghamshire Live,* 24 January 2022

Man digs tunnel from his house to garden shed

An inventor has spent two years digging a three-metre deep, 12-metre long tunnel under his garden just so he won't get wet walking to his shed. The bizarre project, designed to connect his shed to his house, is the brainchild of inventor Colin Furze.

He has worked on the remarkable back-breaking project for months removing an astonishing three-and-a-half tonnes of rubble a day. The 42-year-old, whose digging videos have each attracted more than six million YouTube views, has now finally connected the tunnel to his house in Lincolnshire and says it one of the most enjoyable projects he has ever done.

"It's a very cool project, everyone likes the idea of digging tunnels," said Colin. "I do the projects that people really want to do but don't have the time or money to actually make happen. I'm very lucky as it's quicker to open my back door and walk to my shed, but it's much more fun to use an underground tunnel and it means you don't get wet if it's raining."

Colin started the tunnel under his shed floor in November 2018 and it took him around a year to dig down to three-and-a-half metres deep, working on it when his neighbours were out so it wasn't too noisy. He used a shovel and a bucket with a pulley system to hoist the rubble out of the hole as it got deeper.

He restarted the tunnel in March last year, using hydraulics to dig sideways through the earth and rock. As the tunnel got longer Colin even built a small mine cart and track to help transport the rubble out of the hole. He explained: "We had to dig the whole thing by hand as the tunnel goes underneath the foundations of my shed, garage and house. It was very hard work but also one of the most enjoyable things I have ever done. We wanted to keep the noise down for my neighbours so used a shovel and hydraulics, which were really quiet."

The tunnel, which is 1.2 metres wide and two metres high and comes up in a cupboard in Colin's kitchen, has been reinforced with steel and concrete. Colin, who is renowned for his inventions, including the world's fastest mobility scooter and a drivable hot tub car, added: "It's very spacious in the tunnel, everyone who visits wants to try it out."

SOURCE: *The Mirror,* 20 March 2022

China believes nuclear bunkers are not what they used to be

China has built a new research facility to simulate an attack by nuclear bunker-busting weapons and learn how they damage defence facilities, even those built at extreme depths, according to military scientists involved in the project.

In the past, shelters buried several hundred metres deep were rated nuclear-proof but the Chinese test facility shows that a tunnel more than 2km under the surface could be destroyed, according to the researchers.

In one test, the simulated tunnel almost crumbled after taking hits the effective equivalent of five consecutive strikes by earth-penetrating nuclear weapons, an outcome that would have once been considered impossible. For instance, the Cheyenne Mountain Complex, home to the North American Aerospace Defence Command, was dubbed by the US military as the "most secure facility in the world" because it was protected by granite above more than 500 metres thick.

The Russian government's doomsday shelter was buried 300 metres deep in the Ural Mountains. West of Beijing, China's Joint Battle Command Centre, for extra precaution, was built in natural karst caves about 2km underground.

Openly available information suggests most ground-penetrating weapons could not reach a depth beyond 40 metres.

But with the recent rapid development of technology, existing safety standards may be outdated and have "severely underestimated the actual impact" of nuclear weapons, said Li Jie, lead project scientist with the Army Engineering University of PLA in Nanjing, Jiangsu province, in a paper published in the peer-reviewed Chinese Journal of Rock Mechanics and Engineering last week.

According to some calculations by Chinese researchers based on underground nuclear testing data and computer simulation, the destruction caused by a nuclear bunker buster using the latest technology could reach three to 10 times deeper underground than previously thought.

SOURCE: *South China Morning Post,* 8 April 2022

Grant Aid Financial Support

Bob Templeman

Roger Gosling's graphic article in the December 2021 issue of this magazine, of a dramatic cave rescue from Ogof Ffynnon Ddu cave system in South Wales, carried a footnote that Sub Brit had awarded a donation to the British Cave Rescue Council to fund development and purchase of casualty rescue bags and jackets.

As a non-profit-making registered charity, Sub Brit has over the years been able to gift many thousands of pounds in grants to support individuals, schools, community groups and organisations undertaking underground projects that provide public benefit and align with Sub Brit's aims.

For example, in recent years we have funded rubble skips for Friends of Wilkinson's Tunnels in Liverpool; new public access staircases for both these Friends and the Wartling Rotor Bunker; mineshaft capping for Grassington Mines; and information boards for these mines and for two ROC Posts which open to the public.

We have also made donations towards campaign literature for Halstead 21st Century Group supporting the retention of the Courtauld ARP Shelters; the opening of a 'lost' air-raid shelter at Maidstone School for Girls as an educational resource; and a new tunnel at Reigate Caves to allow continued public access – which many Sub Britters enjoyed visiting in February this year!

In 2021 we approved and made a new grant of £2,700 to the British Cave Rescue Council (BCRC), just before that most extraordinary cave rescue in South Wales. This grant was to help towards the cost of equipping the sixteen UK and Ireland cave rescue teams with a newly developed casualty evacuation bag and a casualty jacket of improved design.

The Committee sees this type of funding as a vital part of our activity. Although much Cave Rescue activity is in natural formations, rescue teams are also active in locating those who are in trouble in man-made structures such as disused mines. At the time of writing, the British Cave Rescue Council plans to start the initial distribution of both the garments and casualty rescue bags in April 2022.

In order to provide transparency and ensure due diligence, our Grant process starts by an organisation, or an individual, completing an application form (available on our website) and submitting their request to the Sub Brit Committee. We do our best to process these as quickly as possible, using the online Committee Forum rather than waiting for the next scheduled Committee meeting. Following a review of the application, which takes account of the project's alignment with Sub Brit's objectives, the costings and the business case (including other funding sources), we may be able to make a prompt decision or occasionally need to seek further information or clarification.

We usually require a plaque or similar acknowledgment of Sub Brit's sponsorship, as a condition of the grant. Where appropriate, we may suggest additional interpretative signage (which would then incorporate the funding acknowledgement and our logo). Almost invariably, of course, we also seek a Sub Brit visit and/or ongoing access to the site.

If we decide to make a grant, we notify the applicant and usually make payment against submission of invoices for work undertaken. In the case of BCRC, the initial application was submitted in mid-September 2021 and approved for an award early the following month. On receipt of invoices, the grant was paid in full in November 2021.

With the lifting of Covid restrictions and emergence of a 'new normality', you may have knowledge of a worthy valid project that may benefit from Sub Brit's financial assistance. If so, the Committee would be pleased to receive an application for a Grant; and we will work with you to ensure that any resulting application contains the information we need to make a prompt decision.

WORLD WAR II AIR RAID SHELTER
The air raid shelter was constructed in 1938 for the protection of those living in St Leonards Court. It was designed to hold forty eight people, approximately half the number of residents.
It consists of four compartments either side of a central corridor. The shelter is accessed down steps from the conical brick turret entrance.
It is Grade II listed in recognition of its setting, high design specification and survival of most of its original fittings which give a clear impression of how the shelter was used.
Male night room
Female night room
Male day room
Female day room
Entrance

Display Board at St Leonard's Court air-raid shelter in East Sheen. It is typical of the type of display we encourage where a site has been supported with Sub Brit funding, research or photography. The QR code links directly through to the Sub Brit site record. photo Clive Penfold

Julian Francis la Fontaine Nowill, 1960 – 2022

An appreciation by John Smiles

Photo Hillary Shaw

With great sadness, I must relate that my dear friend Julian Nowill died, aged 62, on 6 February following a prolonged illness.

Julian was an avid explorer, and was well-known to many Sub Brit members, either from shared adventures or as the organiser of trips in his native Devon and Cornwall, and in Chernobyl, Ukraine.

Born in Istanbul on 27 January 1960, Julian was always destined for the path less travelled. He recently recalled to a friend, "... in August 1957, my mother took up a new post with MI6 at Beirut, under station chief and communist spy Kim Philby. She met my father Sidney in Istanbul, and six months later, they were married and jetted off to the USA on a Boeing 707 for their honeymoon."

Julian would end up returning to the UK for his education (Ampleforth and Aston University), ultimately qualifying as a Stockbroker. But his professional life – even though he was very good at it – was merely a device to enable him to pursue his myriad interests.

Having chatted online for some time, I first met Julian at the Mount Wise bunker in Plymouth in 2004. He arrived in one of his usual array of forlorn bangers – in this instance a tatty blue Lada with stern warnings picked out in bold Cyrillic script on most panels. This was just one of the delightful eccentricities which, coupled with his warm sense of humour, quick wit, boundless curiosity and trenchant disregard for rules, risk and conventionality, made Julian such amazing company.

His funeral, held near his home in Whimple, Devon, on 21 February bore testament to how many people shared my esteem for Julian. Filling the modest village hall to overflowing, there assembled well over a hundred friends who shared his overlapping passions for travel, broken landscapes, commercial jets, brutalist architecture, mine exploration, Cold War relics, people living in dictatorships and thoroughly unloved Soviet and British cars (which he happily piloted all over Europe, Central Asia, Africa and the Middle East).

A self-confessed 'crap car Svengali', this last combined Julian's love of travelling to unconventional locations, often behind the wheel of the most hopeless heap money couldn't buy. As the creator of the Plymouth-Dakar Challenge in 2002, he is widely held to have invented the concept of banger rally – mimicking the Paris-Dakar, but limited to cars that cost less than £100. The first event attracted 52 cars, peaked at over 200, and lives on today under the auspices of Julian's friend Dave Clement, a veteran of the second.

Julian's love of travel and exploring were forged early on. He regularly flew between Turkey and the UK on his own as a child, and grew to love both the process of air travel and the aircraft themselves – the clutter of exotic stamps in his passport and the aircraft safety cards that paper the walls of his downstairs loo both offering mute proof.

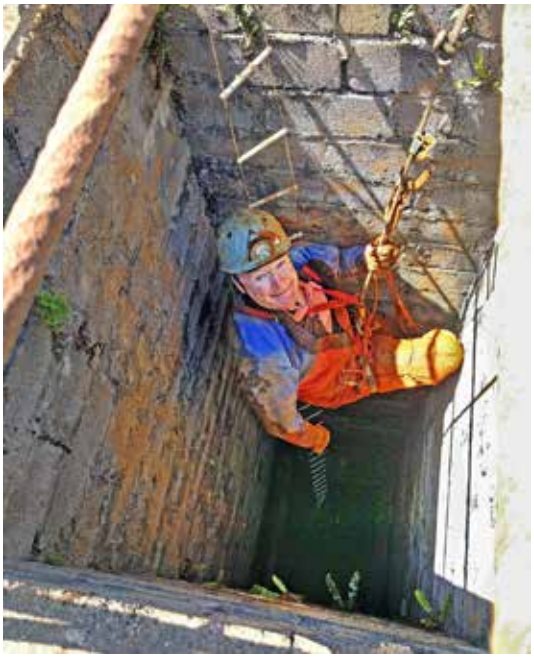


Photo John Smiles

His favourite motto – "everything will be fine" – was central to his attitude to risk versus opportunity for adventure, and this took him into some unbelievable territory where many would fear to tread.

From deserted Soviet monotowns in the far north and east of the former USSR, to Antarctica, Mali, Iraq, Iran, Afghanistan (after the war but before the collapse), all the other central Asian republics, Western Sahara, North Korea, a ship breakers in Bangladesh, or down a working Moroccan mine (where they let him fire the explosive charges because he asked nicely), he was indefatigable.

Everywhere he went, he just rubbed along by beaming

Photo Hillary Shaw

broadly and saying a cheery "Hello" in his faintly BBC accent. If he was somewhere he shouldn't really have been – as in one instance with me in the boneyard of a Chinese military airfield – he used exactly the same approach, sometimes adding "only trespassing" if he thought the approaching security guard or owner might speak English. I even saw him disarm our fiercest Government 'minder' while we were in North Korea – offering some throwaway hotel room doodad with great ceremony, bowing ever so slightly and saying "for your wife". On the same trip in 2012 we had the rather surreal experience of randomly meeting two other Sub Brit members – David Ferris and Stewart Wild – as we alighted our tour bus halfway along the Number One Scout Highway (so-called because that's precisely who built it) between Pyongyang and Wonsan. I am happy to report that everyone reacted to this astonishing coincidence with the cool restraint expected of the Englishman abroad in a Fifties film.

I was lucky enough to share just a few of these travels with Julian. We also covered plenty of core Sub Brit activities exploring bunkers and mines throughout the UK, Chernobyl and Cold War sites across Ukraine, Stasi and NVA sites in Germany, the Catacombs of Paris, the Maginot Line and its predecessors elsewhere in France, and WWII sites across Europe.

Julian was also probably my most reliable exploring partner for distant 50:50 targets where a great deal of trouble wouldn't necessarily get us into a given site. Heard a site *might* be accessible? Just call him with the info, and he'd happily jump into any of his funny little cars and start driving.

Following a Facebook flurry, he once set off from Exeter after work on a weekday to visit the Bawburgh ROTOR SOC and RGHQ in Norwich – a 600-mile round trip. Naturally, he was on time for work the next day (and happily he got in, met the caretaker and the attending Police officers, and they all had a look round together).

Under Covid, Julian's wings were cruelly clipped by both the lockdowns and his illness, but he kept on exploring, in whatever way he was able, for as long as he could. We managed four decent (albeit all UK) trips in 2020 and 2021 into mines and former military facilities in Devon, Cornwall, Cumbria and Kent.

I will miss his hilariously haphazard trip planning – accommodation not booked, mine entrances misremembered, totally lost underground due to surveys carefully packed but left in the car – almost as much as his company underground on future explores. Details were not his forte.

I feel we have lost another of the great English eccentrics. There seem to be fewer every year now, and there will really be "No (more) photos!" this time.

I am one of those lucky ones who knew this quirky, extraordinary man and he made my life better through the time we spent together, pondering over some unknowable underground machines and laughing a lot. I have little doubt that I will not be the only person reading this who feels the same way.

Julian is survived by his brother Edward, his second wife Hilary, and his children Alastair, Mia and Celia.

With special thanks to Keith Adams of AROnline for automotive details.

Mangup Kale underground churches, Crimea, Ukraine

Nick Catford

One of numerous underground churches at the east end of the Mangup plateau. Steps to the surface are seen on the left. Photo Robin Ware

I made two visits to Ukraine in more peaceful times. The first was in May 2005 when a small party from Sub Brit comprising myself, Robin Ware, Mark Bennett and the late Dan McKenzie and Mike Barton went there primarily to visit the former Soviet submarine servicing facility at Balaklava in Crimea in the south of Ukraine. This is featured on the Sub Brit website and in *Subterranea* 26.

We had nothing planned for the rest of the week so on one day we decided to visit Mangup Kale (Fort Mangup), a historic fortress located on a 180 metre high plateau about thirteen kilometres due east of Sevastopol. Mike had seen the site on a map and was intrigued by a number of underground churches that were shown.

In early medieval times it was known as Doros or Dory by the Byzantines; later it was given the Kipchak nomadic Turk name Mangup. We knew nothing of the history or accessibility of the site but decided to visit anyway. Our landlady's husband Sergej drove us for the day, all six of us in his beat-up old Lada.

Map of Crimea with Mangup Kale highlighted in yellow

A tight squeeze

Luckily I had the front passenger seat with the other four crammed into the back like sardines. The car was clearly overcrowded but if you get stopped by the police, as we did several times a day, you give them a little money – usually the equivalent of £2 – and they let you carry on after some shouting and gesticulating.

Khadzhi village, the Mangup mountain plateau towers above us. Photo Nick Catford

We arrived at the tiny remote village of Khadzhi Sala, with the plateau of Mangup mountain towering above us. It was clearly going to be a very steep 2km climb through a ravine up to the plateau which covers an area of some 90 hectares, so the party split up to let the fitter amongst us go ahead; this left me and Dan bringing up the rear. The trail through the ravine between two fingers of the plateau began about 100 metres beyond the village.

Alongside the steep path we passed a large number of ancient gravestones and memorials from a Karaite Jewish cemetery; all had inscriptions in Hebrew. Turkic-speaking Karaite Jews have lived in Crimea for centuries and are first known there in the 14th century. The first Karaites appeared on Mangup under the Greeks. They were probably Jewish merchants who kept shops excavated in the citadel.

After about twenty minutes' climbing Dan gave up, saying it was too steep for him, so he said he would return to the car where Sergej was waiting. I carried on, determined to make it to the top. I soon saw a couple of men coming up behind me so I stopped to let them pass. They were two Russians on holiday in Crimea. I don't speak a word of Russian and they didn't speak a word of English but we got on like a house on fire.

The spirit is willing

They had a bottle of vodka which they were happy to share and although we couldn't understand each other they were a big help getting me up to the plateau. On reaching the top we parted company with a lot of handshaking and hugging. At the top of the path there was a cave and close by a tap poking out of the rock with lots of broken cups lying around. I assumed it was fed by a well. The water was crystal clear and very cold and just what I needed at the end of a very steep climb.

At the top of the ravine there were a number of underground rooms cut into the cliff, at least one of which had been used as a barracks. Within thirty minutes I caught up with the rest of the party.

The ancient capital of Feodoro, the principality of the sixth-century Ellinized Goths and Alans was in a spectacular location due to its sheer cliffs and was the largest fortress and city in Crimea for about 500 years. The plateau is shaped like a four-fingered hand with a sheer drop on three sides.

The steep path up the ravine passes through a Karaite Jewish cemetery. Photo Nick Catford

Two of many memorials in the cemetery with inscriptions in Hebrew. Photo Nick Catford

The first cave was at the top of the ravine before reaching the plateau. A very welcome water tap was found nearby. Photo Nick Catford

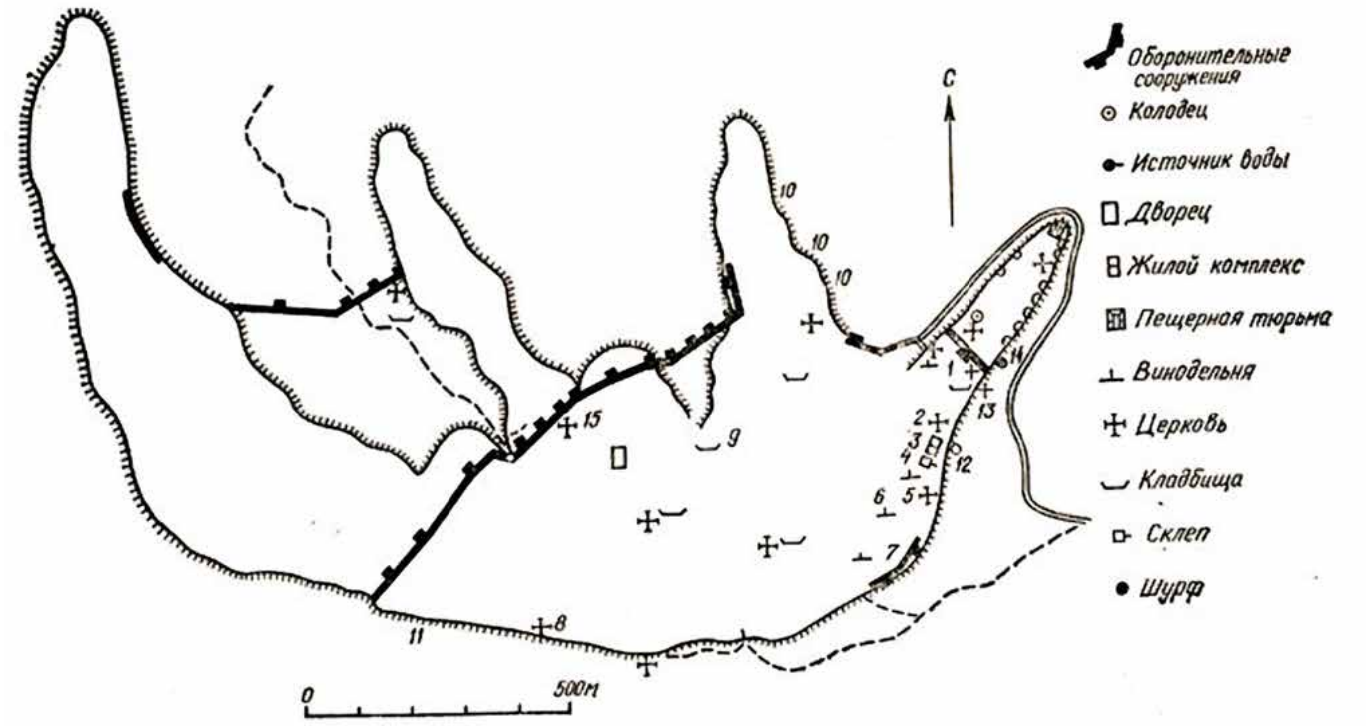
Byzantine history

The fort was built in the 6th century by Justinian l and was later inhabited by the Crimean Greeks as a good vantage point. However, despite its strategic location the city was eventually taken by the Turks in the 15th century after a six-month siege and a certain amount of trickery.

Having reached the top of the plateau, I followed the trail to the furthest finger of land where there are many ruins still visible today relating to its diverse use until 1774 when the fortress was abandoned by the Turkish garrison. The last inhabitants, a small community of Karaims, abandoned the site in the 1790s.

The original Byzantine ramparts, the citadel with its surviving defensive walls and towers, several Orthodox underground cave churches, the mosque and the underground dungeons are all still intact and open for exploration. Some have open windows in the cliff face with a sheer drop down to the valley below. Most of the underground structures are located on the east finger of the plateau.

Turkish masonry wall around the edge of the plateau at the top of the ravine. Photo Nick Catford



Plan of the plateau. The citadel and most of the underground churches are on the east side of the plateau. The defensive wall runs roughly north west to north east across the centre of the plateau. The ravine is between the first and second finger of land.

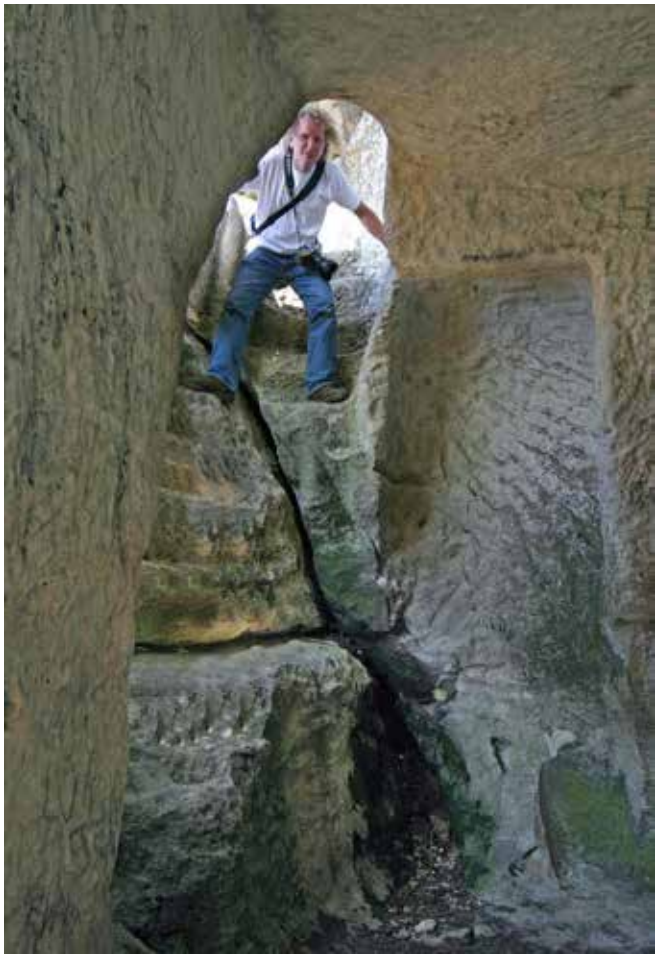
Barracks for the guard near the top of the ravine. Photo Nick Catford

Having photographed the remains of the fortress and the underground churches we made our way back through the ravine to Khadzhi Sala where we met up with Dan and Sergej. It was only then that we found that there was an off-road vehicle available that would have taken us to the top of the plateau by a different, longer route for the equivalent of just 50 pence!

Entrance to the citadel. Photo Nick Catford

The citadel. Photo Alexey Malgavko

Mark, Robin, Dan and Mike were shoehorned into the back of Sergej's Lada for the return trip to our guesthouse after a very enjoyable, albeit tiring day. Mangup Kale is part of Crimea's Bakhchisarai History, Culture and Archaeology Museum Reserve.



Mark Bennett scrambling down the stone steps into one of the underground churches. Photo Robin Ware

Inside one of the underground churches. Photo Nick Catford

Looking down from the plateau into the valley below. Photo Nick Catford

Many of the underground rooms have openings in the side of the cliff face. Photo Nick Catford

Some people have a good head for heights. Mark Bennett sits with his legs dangling over 180 metre drop. Mike Barton looks on. They have stepped out of one of the cave room windows. Photo Nick Catford

The entrance to one of the underground churches. Many are just a hole in the ground with steps down. Photo Robin Ware

Some entrances are walk in but always close to the cliff edge. Photo Robin Ware

Gruve 3 – An Arctic Mine Frozen in Time

Marcus and Hal Beddoe

View from outside Gruve mine looking towards the old coal dock on Adventfjorden

High in the Arctic, some 1,300km from the North Pole, is the historic Norwegian mining settlement of Longyearbyen, located on the archipelago of Svalbard. At a latitude of 78 degrees North it is the most northerly town in the world. Although coal has been mined continuously in Longyearbyen since 1906 (apart from a brief interlude during World War II) today it is tourism and scientific research which are the mainstays of the local economy.

Coal Mining

The first of seven mines was started by an American John Munroe Longyear and the American Arctic Coal Company in 1906. Then in 1916 due to the economic effects of World War I, the Store Norske Spitsbergen Kulkompani (SNSK) purchased the town and mining operations. Since 1976 the Norwegian state has owned 99.94 percent of SNSK and, at its peak in the 1980s, some 500,000 tonnes of coal were extracted by the company each year.

In recent times the last remaining coal mine, Gruve 7, has been producing around 100,000 tonnes per annum with about 25,000 tonnes being consumed by Norway's last coal-fired power station which provides heat and power to the town through a district heat network. However, the Norwegian Government has terminated the supply contract with SNSK for coal from Gruve 7 and the last

The entrance to Gruve Mine No 4, approximately 3km southwest of Longyearbyen. Access is not possible as after some 5-10m the entrance is filled with ice and snow. It is believed to have closed in 1970

remaining Norwegian mine on Svalbard is scheduled to close in 2023. What is to replace coal as a power source is the subject of much local debate, with diesel and possibly gas providing short-term solutions until the feasibility of more-renewable sources is established.

Geopolitics

Although Svalbard is under the sovereignty of Norway, it is a demilitarised zone and is governed in accordance with the 1920 Treaty of Svalbard which gives signatories

Coal hopper outside Gruve 3

(of which there are currently more than forty) certain economic development rights.

Aside from Norway, Russia is the only other country actively mining on Svalbard at the settlement of Barentsburg, which is run by the Russian company Trust Arktikugol. Like the Norwegians, the Russians are expected to develop tourism and science as the main economic justification for maintaining a presence on this strategically important archipelago.

Into the frozen depths

The start of a 500m walk deep into the permafrost of Gruve 3

In the summer of 2021 my son and I travelled to Svalbard, returning to the islands I had first visited some thirty years ago to study the impacts of tourism on the natural environment. A highlight of the trip was a three-hour guided tour around the mine Gruve 3. The mine is located close to the iconic Global Seed Vault and is owned and managed by SNSK.

Gruve 3 was first surveyed in 1969 with mining starting in 1971. By the mid-1970s Gruve 3 accounted for around half of all SNSK's coal production on Svalbard. The mine operated until 1996 when it was closed at short notice as extraction was no longer commercially viable.

Fully equipped maintenance workshops have been left untouched for nearly 30 years

An abandoned winch within Gruve 3

Pit props loaded ready for a shift that never took place

Although marketed as a tourist attraction, there are no interpretation boards nor a gift shop; the mine and buildings have been left untouched since the miners ended their last shift in 1996. Coats, boots and lamps are still hanging in the changing rooms and the offices are full of paperwork. The maintenance workshop looks as if the miners have gone to lunch but has been quiet for nearly thirty years.

Due to the permafrost the temperature is at a constant minus 3-4 degrees Celsius in the mine and care was needed not to trip over discarded equipment and tracks or slip on icy patches. With no electric lighting, our old miners' headlamps were our only means of penetrating the dark depths of the mine.

Original wooden pit props visible in the side workings. Miners preferred these props to the heavier but safer hydraulic ones

The excellent Norwegian guide explained that it was a 'low drift mine' as the coal layer was between 60– 90cm in thickness and the miners had to lie on their sides using heavy handheld drills to break up the coal. The mine operated a 24-hour three-shift working pattern – with the first shift propping up the tunnels, the second drilling out the coal and the third moving the coal out of the mine.

The restricted working height of a coal seam

Hand-held miners' drill, left in situ at the end of the last shift in 1996

Nordic Genebank

In 1984 an organisation called the Nordic Genebank established the world's first seed depository in a transverse passage some 285m into the mine at about 70m below the surface. The location was chosen as the permafrost ensures that the seeds remain frozen at a constant temperature which avoids depending on mechanical refrigerators that could fail in a sustained power outage.

The sealed entrance to the world's first permafrost seed depository. Note the layer of ice on the roof of the mine

Every five years until 2084 the seeds will continue to be tested to research the germination longevity of seeds stored in this manner. Further information is available from the Nordic Genetic Research Centre (nordgen.org). This seed bank long predates the purpose-built Global Seed Vault which was constructed less than a mile from Gruve 3 and opened in 2008.

Looking towards the entrance to the Arctic World Archive

Arctic World Archive

Further into the mine is another storage project called the Arctic World Archive (arcticworldarchive.org). This vault was opened in 2007 and a company called pipl.com stores digital data on specialist piplFilm which has a design life of 1,000 years.

According to our guide, data is also stored at the molecular level on DNA – an emerging technique which offers unlimited storage potential. Works of art, Vatican archives and satellite data from the European Space Agency are among the organisations and countries which are utilising the vault as secure long-term storage for future generations.

All in all, the excursion into a mine in the Arctic offered a fascinating insight into how a mine abandoned for nearly thirty years has evolved into a high-tech data storage facility and a tourist attraction – which has been managed to preserve the authenticity and atmosphere of a working mine.

All photographs are by the authors.

The Arctic World Archive stores digital data on DNA from the likes of the Vatican, the United Nations and the European Space Agency

In the workshop only the lack of a fire in the forge reveals that the miners have not just stepped out for lunch...

Profiles of new members of the Sub Brit Committee

We'd like to welcome several new members to the Sub Brit Committee – James Buller, Dave Maguire, Jay Curtis and Neil Iosson. Some are very new and some have been with us for a while, but have not been introduced. All will be standing for the coming year – and may well have been elected at the AGM by the time you receive this magazine.

Neil Iosson, Vice Chairman (elect)

I have passionately enjoyed underground experiences since childhood, and I was probably first introduced to them through the Snowdonia slate mines. There has always been a sense of mystery – about what lies beyond a rock fall or flooded level – as well as the hidden networks of tunnels that lie beneath our feet.

I also got a taste of the underground, when, for a number of my formative teenage years I was involved in live action role-playing, dressed as an orc or a wizard running around the 'caves' of Chislehurst, illuminated with a 'candle' and hitting friends and enemies with a rubber sword. I now know that the 'caves' were quarries adapted as air-raid shelters. Since then, I've become interested in a wide range of subterranean spaces – in particular military installations and mines.

I live in Ditchling in East Sussex and my professional background is as a doctor, specialising as a GP and I now work as a clinical director for a GP federation on the south coast and also develop software for use in GP practices.

I first heard about Sub Brit after falling down the rabbit hole of the website and reading Nick Catford's many excellent site reports with increasing fascination – and I wonder how many other people have been drawn in the same way.

I joined Sub Brit to attend the Liverpool conference a few years ago and found the trip to Williamson's Tunnels to be a journey into another, very eccentric world. Sub Brit has expanded my horizons on the sheer variety and number of dark spaces in our small island and on the way introduced me to the pleasures of the NAMHO conference and a more physically challenging approach to mine exploration.

European Sub Brit trips have been another highlight and I've been to many sites I wouldn't have been able to easily access myself and enjoyed a unique way of exploring other cultures and histories. My first trip, to Rome, offered the unforgettable highlight of walking (and crouching and crawling!) through the 1.6km Nemi drain built over 2,500 years ago. I've also really enjoyed helping to guide people around Paddock – hopefully we will be able to do this again one day in the future.

I joined the Sub Brit committee in 2019 primarily to help develop and curate the public website. Since then, I've worked with Richard Seabrook to expand the coverage and improve engagement with both members and the public.

One of my greatest pleasures is to go deep underground, turn off the lights and listen to the space and breathe in the air and absorb the feel and history of a place. I'm keen to help share the pleasure of dank, echoing, decaying underground spaces with fellow connoisseurs and to help new people to enjoy these unique experiences.

James Buller, Social Media

My day job is as a civil servant, Accessibility and Digital Inclusion consultant. I advise people building online services for the government on how to make them usable by people with disabilities and provide alternatives for those who can't/won't be online.

Before that I worked for ten years in the digital media team of Big Lottery Fund, communicating about non-profitable companies applying for National Lottery grants. I came to these user-experience orientated roles from a coding focused job and education.

Alongside all that I've always volunteered in charities at both frontline and trustee board levels. Firstly for Nightline (the student mental health helpline) and currently with Aniridia Network (a rare visual impairment condition support group). I also run the Twitter account for my east London neighbourhood group and help out in other ways. We walk quite a lot of our neighbourhood as my wife and I have a five-year-old retired racing greyhound called Bosco.

I've been a Sub Brit member since 2008. My main interests are 20th-century military and transport stuff, especially the Tube. I was often a marshal at Paddock open days and in 2018 I plucked up the courage to be a tour guide, which was a thrill. I've been on a few visits in southeast England and France too.

Back in 2011, I suggested a Sub Brit social media presence and that I'd manage it. With help from a few others I've done that on Twitter and Facebook ever since – with very gratifying success. If you're a follower you'll have seen my output. You may also have seen me at the front of London Day Meetings live tweeting what's happening.

I've joined the committee to better integrate this activity plus lend my expertise in charity management, communication and meeting user needs.

Jay Curtis, Trips and Grants coordination

I joined Subterranea Britannica about seven years ago, although I had met and was familiar with some of the members through my voluntary work for other societies.

Although I work full time, I have been a keen volunteer on several heritage sites around the Kent area. I started with Western Heights Preservation Society in 2010, working in the Drop Redoubt Fort in Dover. In more recent years this has been working alongside my partner, David, in the shop/information point for the Grand Shaft triple spiral staircase rather than the Fort.

A year or so later, I started helping Thames Defence Heritage at the New Tavern Fort in Gravesend. This was through a friend who was volunteering there at the time. I continued to get more involved with the organisation including revamping the displays at the Gravesend Cold War Bunker (actually a civil defence control centre), prior to restarting tours. I then became part of the tour guiding team.

In my younger days I have been fortunate enough to visit places such as Australia, New Zealand, Hong Kong, Canada and Hawaii for holidays. In more recent years it has been places that cross over into my interest of Forts, underground bunkers and other historical sites. This has included places such as Poland, Gibraltar and Ukraine (including three visits to the Chernobyl Exclusion Zone). One or two of these were with Sub Brit or private trips arranged with other Sub Brit members.

I look forward to working with Sub Brit on the Committee, getting to know the rest of the team, and working in a way which I feel may be quite a different set-up compared to being on site working with fellow volunteers and showing visitors around.

Dave Maguire,
Subterranea content and Trip support

I became aware of Sub Brit whilst on holiday on the Norfolk coast and to celebrate my birthday we visited the excellent radar museum at Neatishead. Here we found a reference to Sub Brit; I think it was in one of Nick Catford's books on Cold War bunkers.

My interest within Sub Brit is mostly channelled towards military installations. For the last 35 years I had been working on economically designed modern buildings. Since joining Sub Brit I have been fortunate in visiting numerous sites with large lumps of reinforced concrete and steel, which include the V2 launch bunker Blockhaus d'Eperlecques in France and the Adolf Kannon, Norway. These are in stark contrast to the modern lightweight buildings I had been working on!

During the last fifteen years I have been designing ventilation and cooling systems for huge data centres. It's all handy knowledge when it comes to bunker construction and ventilation. Most systems have redundant duplicate back-up components and figuring out what was required in a failure scenario certainly challenged my grey matter.

Now I enjoy trying to understand military installations. Rather than asking "why did the architect do that", I now ask myself "why did the ***insert*** 'military branch of government of your choice' build that?" What use was it? The most important question for me though is: "How was it intended to work?"

I have recently been lucky enough to visit the MRU on the Polish western border. Trying to understand the reasons and politics behind its design has intrigued me and I haven't yet found all the answers. It appears to be another great waste of resources. I'm also booked on the upcoming Maginot Line trip, which I am grateful to the organisers for planning.

My father was a joiner and I think this is where my interest in drawings and architecture stems from. If I can find a plan of a new bunker then it's been a good day. If I find a

section as well, then the day is complete. I was recently privileged to meet Robert M. Jurga who has provided isometric cutaway drawings for many historical books on bunkers. His drawings have inspired me to visit as many different types as possible. Also, the legend or key on each drawing identifies each room and its purpose, which has prompted me to imagine its operational use as part of the defensive line.

I've been on the committee since November 2021 and I've certainly had my eyes opened regarding how much work goes on behind the scenes. The old metaphor of lifting a rock, springs to mind. The committee members work extremely hard and the level of their commitment is inspiring.

I have been following-up on the great response to the appeal for *Subterranea* articles last year and have been encouraged by the willingness of members to write articles. Even though I don't know many of you personally, it has been rewarding to make contact, although often only by email so far.

Although I've only been a member of Sub Brit for five years or so, I have however been exploring underground since the age of fourteen, when my group of friends discovered Dungeons and Dragons, which I still play to this day. So far, I've not met any real dragons underground, unless you count flamethrowers. Other hobbies include an ROC bunker (should anyone have a GZI for sale please let me know), designing for 3D printing, wargaming and boardgames.

A 1917 Channel Tunnel proposal

Sir Francis Fox, a member of the Institution of Civil Engineers, read a paper on geographical aspects of the Channel Tunnel at a meeting of the Royal Geographical Society on 23 April 1917, at which time of course World War I was in progress in France. The lecture was subsequently published. At that time, naturally, the risk of a German invasion through the tunnel was an issue. An illustration in the printed paper is interesting to compare with the 1990s tunnel as built.

There were to be two bores, one each for eastbound and westbound trains, each of 20 feet diameter, 50 feet apart. Cross tunnels every 600 feet would allow trains to transfer from one bore to the other if and as required. No service tunnel for emergencies was envisaged, but a 'drainage heading' was to be provided around 50 or 60 feet below the running tunnels. At the English end, inside the three mile territorial waters limit, there was to be a 'water lock' in a low point where a mile of the tunnel could be deliberately flooded, it being stated that 'this water … can only be pumped out by machinery in Kent'.

The tunnel as we have it today, of course, does have two low points either side of a summit under the middle of the crossing, from which any accumulated water can be pumped out to England and France. It has crossovers only at two points, and a service tunnel running (mostly) between the running tunnels.

SOURCE: FOX, Francis, 1917, Geographical aspects of the Channel Tunnel. Reprinted from the *Geographical Journal* [Royal Geographical Society], August 1917: 11pp

Toxic Town USA: Centralia and the underground fire that destroyed it

Dr Jason Holdcroft-Long

WARNING - DANGER
UNDERGROUND MINE FIRE
WALKING OR DRIVING IN THIS AREA COULD
RESULT IN SERIOUS INJURY OR DEATH
DANGEROUS GASES ARE PRESENT
GROUND IS PRONE TO SUDDEN COLLAPSE
Commonwealth of Pennsylvania
Department of Environmental Protection

Danger: a sign warns visitors to Centralia that they are on dangerous ground. Photo Flickr/SonnyandSandy

In 1962 the long-mined coal seams beneath a borough of Pennsylvania started burning. As the fire spread further beneath the feet of its unwitting inhabitants, it rendered the ground above ever more unsafe as foundations combusted and dangerous gases seeped through. Sixty years later the town is all but gone. Millions of dollars spent trying to save it from the flames have failed to extinguish the fire underground that will burn into the next century.

This is the story of how the black gold that made a town rich went on to destroy it, and displaced a community from their poisoned home.

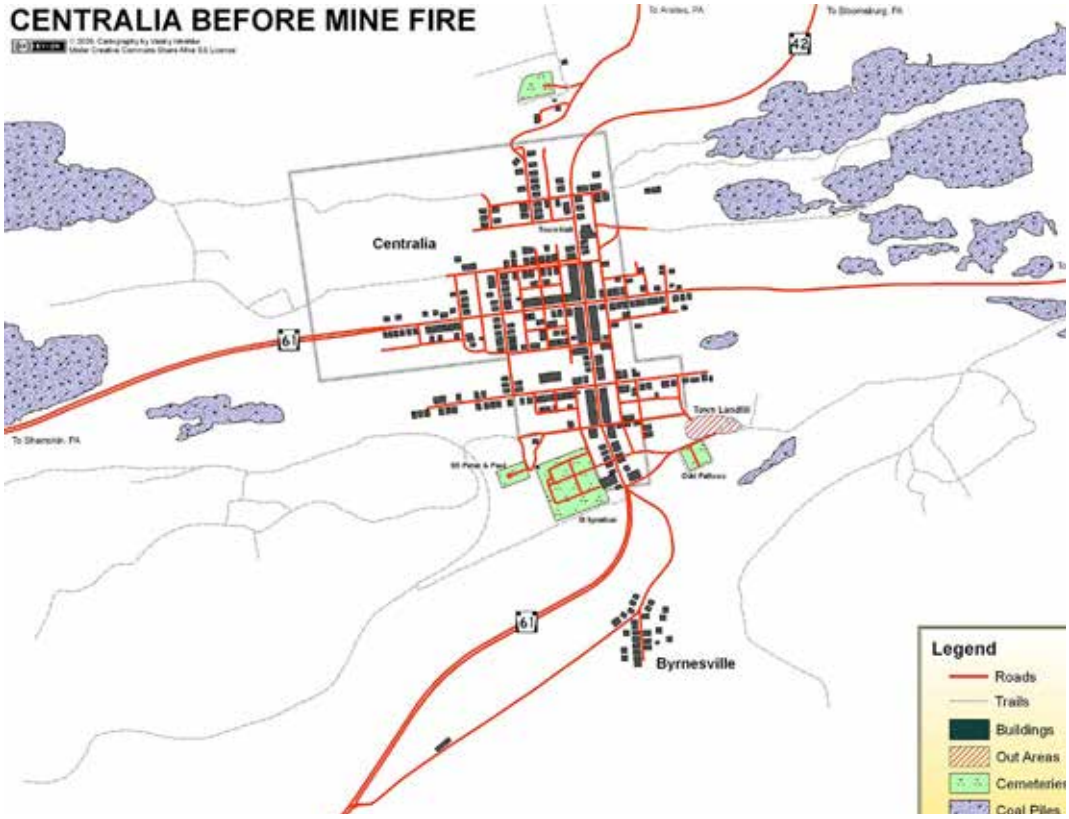
The Centralia Colliery breaker and engine house in 1889, overlooking the town below. Photo source offroaders.com/Robert Evans

Coal – a town is born

The Appalachian Mountains of northeast North America overlie vast deposits of coal. In the folded strata of northeastern Pennsylvania this is in the metamorphosed form of anthracite or 'hard' coal, prized for its high carbon content. Land in what would become Centralia was first purchased in the late 18th century with exploitation of its mineral resources in mind. In 1842 the area was bought by the Locust Mountain Coal and Iron Company.

Initially called Centreville, the town is considered to have been founded by Alexander Rae, who represented the coalmining interests. In 1856 the Locust Run and Coal Ridge mines opened, followed by the Hazeldell Colliery in 1860 and in 1862 the Centralia Colliery. In 1865 Centralia's first Post Office was opened, ZIP code 17927, and in 1866 Centralia was formally declared a borough.

Looking south on Locust Ave circa 1915. Photo source offroaders.com/Robert Evans



Centralia before the mine fire. Image source Wikipedia/user Vasiliy Meshko

Mining of anthracite coal in Centralia peaked in the late 1920s before the Wall St Crash saw the closure of five major mines belonging to the Lehigh Valley Coal Company. Notably, bootleg miners continued pillar robbing (referring to the removal of the coal pillars supporting the roof, left behind by commercial mining operations). These extractions would later inhibit attempts to extinguish the mine fire. By the 1950s, major coalmining activity was winding down and only small bootleg and strip-mining operations remained. With vast unfilled coal voids beneath Centralia, the stage was set for the ongoing tragedy to begin to unfold.

Fire in the mine

Coal mine fires are not a new phenomenon. The town of Jharia in northeast India and China's 3,000-mile coal belt are just two of the many places around the world where coal seams have been burning for decades. Reportedly, ground beneath Mount Wingen in New South Wales has been smouldering for over six thousand years, making it the oldest known ongoing underground coal fire. What made Centralia unusual was how the habitation overlay the burning areas, and some particular features of the underground situation which helped the fire to propagate more effectively (on which more later).

How did the fire start? There are several theories about this, including that it started with a mine explosion thirty years before. The most commonly agreed explanation, and that accepted by journalist David DeKok and cited by Pennsylvania's Bureau of Abandoned Mine Reclamation, has to do with Centralia's 1962 annual Memorial Day celebrations. Prior to the day, Centralia councillors agreed a clean-up was needed, particularly of the new landfill that filled a long pit excavated by Edward Whitney's strip-mining operation in 1935.

One end of the pit was adjacent to the corner of Odd Fellows Cemetery, whose Trustees had reluctantly agreed this use of the 300ft-long, 75ft-wide and 50ft-deep trench on the basis that it might reduce the problem of illicit fly tipping nearby. The problem of such uses of old coal pits leading to mine fires was not beyond the imagination of Pennsylvania's legislators. They had enacted Act 471 in 1956 to mandate regular inspection of mine pit landfills and a permit system for them to operate.

The regional inspector raised concern about several fissures in the Centralia pit where it intersected with older mine workings, and it was recorded in council minutes that "five more holes" had been filled with incombustible materials on his instruction. He was, it seems, satisfied, as the required permit was duly granted.

Looking south on Locust Ave, early 1960s. Photo source offroaders.com/Robert Evans

Fire in the hole

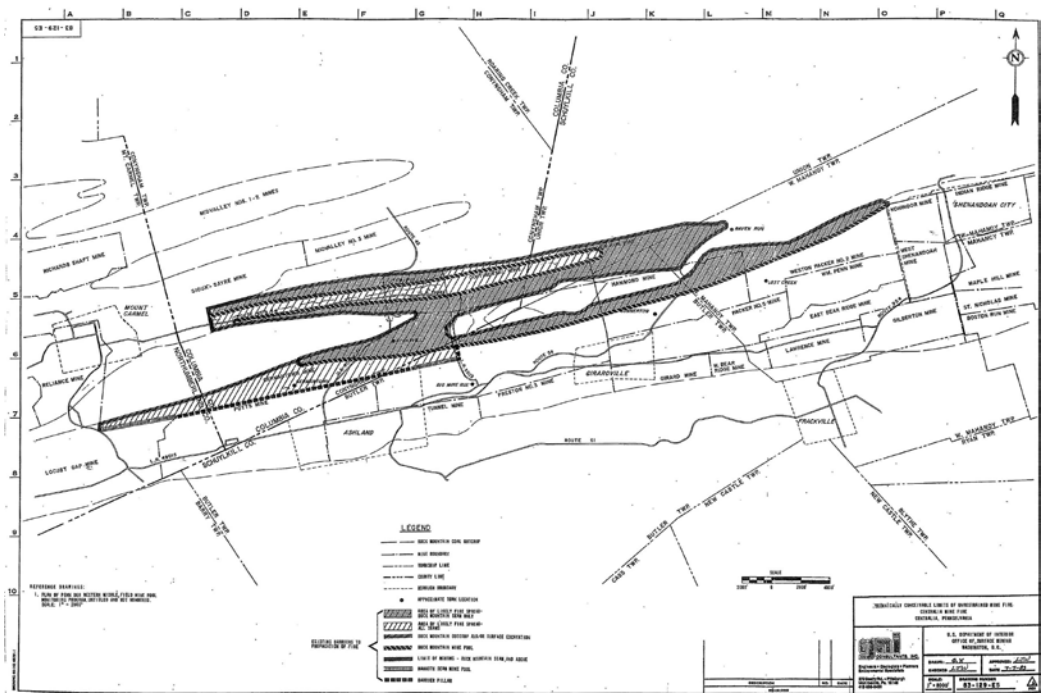
Prior to Memorial Day it was customary to make sure the commemorations would not be despoiled by any unwanted smells or pests, and so it was usual practice to clean up dump sites by burning waste (despite prohibition by the State). On 27 May 1962 the records show that five local volunteer firemen invoiced the town for managing the "fire in the landfill". Their dousing was clearly inadequate, for within days the president of the Cemetery

Trustees was complaining of smoke rising from the pit again. Attempts were still being made over a week later to extinguish the rubbish fire by turning over the material and soaking it.

Those involved recall that at times the flames would leap up when a new area was overturned. Several days into the effort, a large hole at least fifteen feet long and several high was discovered leading into the old mines, not blocked with incombustible material. It is believed that this is the route by which fire entered the underground network.

At this point it is worth considering why the theory that the fire had been burning underground since an explosion at the Bast Mine in the 1930s does not seem to withstand scrutiny. As noted earlier, despite the cessation of major mining activities in the 1950s, bootleg miners continued their work for many years. One such was Frank Jurgill who was mining with his brother nearby between 1960 and 1962. By his reckoning, were the 1930s fire theory true, they should have at the very least seen some evidence of this below ground, if indeed they were not overcome by the gases arising from it. They did not, and were not.

Once the fire was established underground, it was not inevitable that it would grow into the monstrous tragedy that would destroy the community of Centralia. Although by no means a quotidian task, putting out mine fires, for instance by digging them out or flooding and starving them of oxygen, was an undertaking well within the expertise of engineers in a State full of abandoned mines.



Map of the potential spread of the fire, 1983, by US Office of Surface Mining.

The failure to arrest the fire before it became uncontrollable (or at least unaffordable to control) is a Kafkaesque tale of money, the slow turning of bureaucratic wheels and the inordinate complexity of multiple levels of authority and jurisdiction. It is a story that could fill a book, and indeed is exhaustively covered in several, of which the aforementioned David DeKok's *Fire Underground* is probably the most well-known. Perhaps it is best summarised by the resident who described the US authorities as being always "a day late and a dollar short".

Burning through money

In August 1962 the Centralia Council notified the Lehigh Valley Coal Company (quite disingenuously it seems) that a fire of "unknown" origin had started in their mine. That month, a strip miner called Alonzo Sanchez offered to dig out the fire for free so long as he could keep any coal he found, without paying the company. The legal issues around this, and his request to drill down to establish the extent of the fire, put paid to that suggestion.

Days later a contract was agreed with the Bridy company of nearby Mt Carmel to dig out the fire. They were strictly controlled in their project by the Dept of Mines and Mineral Industries, who forbade any exploratory drilling, and grossly underestimated the extent of the fire. Aided by inrushes of oxygen when new areas of underground chamber were breached, the fire stayed well ahead of the project and they had burned through their funding by the end of October.

With a certain irony, it was bitterly cold weather which thwarted the second major scheme. The plan was to pump a mixture of crushed rock and water into the mines ahead of the expansion of the fire, through eighty boreholes. The water supply lines froze, a rock-grinding machine broke down in a blizzard, and yet again the money ran out. The project that began on 19 November 1962 collapsed in the following March. By this time the surface effects of the fire were visible 700ft from its origin.

After the failure of two major projects due in large part to inadequate financing, a new plan was drawn up with three approaches. Two of these involved digging trenches and filling them with material to block the fire, while the third was a flushing scheme of greater scope than had been tried before. Further trenching commenced in July 1963, but in October the excavations revealed that the fire had advanced beyond the trench.

In July 1965 the State and the Bureau of Mines advanced an ambitious new plan. This involved two phases. The first would be backfilling and sealing a number of pits around the fire to reduce oxygen ingress, and flushing in a temporary barrier in preparation for the next phase.

Smoke rising through a fissure in the area of Pennsylvania Route 61 closed by fire damage in 1993. Photo source Wikipedia/user LaesaMajestas

Part two was intended to be a 2,500ft permanent barrier trench filled with incombustible material to 20ft above the coalbed.

Work on this massive project began in November 1966 and the first phase was completed a year later. The engineers found that the fire had advanced further than expected, but it was still deemed controllable. Moreover, they found that excess flushing material was required due to unexpectedly capacious voids, perhaps due to the aforementioned pillar robbing. For the project to progress to the second phase as it was first intended would now require an isolation trench more than 300ft deep, drilled through hard rock. Instead, the plan was revised to employ a mine water pool to limit the extent of the fire at the north side.

Underground barriers formed by pumping fly ash at high pressure through boreholes would then block the east and west reaches. Fly ash is a very fine residue which was sourced from coal-fired electricity stations. It had been used successfully to control mine fires in bituminous coal regions but not, hitherto, in anthracite coal.

High temperatures: barrier failure

The fly ash barrier project was by far the most extensive attempt yet to impede the advance of the Centralia mine fire. During seven years of work from May 1969, over 1,800 boreholes were drilled and injected. At various stages the fire was found to have advanced beyond the expected point and works had to be revised. Nonetheless it was thought that the mammoth effort had successfully halted the progress of the fire towards the homes of Centralia's residents.

High temperatures in several monitoring boreholes on the 'cold' side of the barrier showed otherwise. By June 1977 temperatures were reaching 77 degrees Celsius and carbon monoxide was detected in some boreholes. Barrier reinforcement works were agreed, beginning in February 1978 and completed in November. This was at a cost of $500,000 on top of the $2 million already spent.

Outcrop area of the Buck Mountain coal seam in Centralia, showing a monitoring borehole. Note the melted snow in this area. Photo source English Wikipedia/user Mredden

By this time the fears of residents in the borough were rising and, given the patchy success of the existing barriers, a proposal was agreed (surprisingly with the money) for a large trench to further protect the community. In the event, issues around authority to purchase a handful of private houses which would have to be demolished meant this proposal did not proceed further.

In December 1978, the trench plans were abandoned. Instead it was suggested that every crack and fissure across 35 acres be filled with fly ash slurry and other incombustible materials, a plan that seems somewhat improbable even to those without specialist expertise. Mining engineers have opined that the strength of the fire and the high temperatures below ground would mean that air was drawn in through overlaying soil and rock without any need for visible openings.

In 1979 the recently formed Office of Surface Mining recommended that no further funding be allocated for fighting the fire in Centralia. The US Bureau of Mines had proposed spending $4.5m on trenches to protect the whole borough, but according to a memorandum of 1978, it was not felt that spending this much money to protect half a million dollars' worth of housing and other buildings was an appropriate use of public funds. It is fair to say that they miscalculated.

Why so far so fast?

A recurring theme in the various plans to try to stop the spread of the Centralia mine fire is that it always seemed to be ahead of where the various experts expected it to be. The 1980 report on the control of anthracite mine fires for the Bureau of Mines considers some of the particularities of the situation in Centralia which assisted the propagation of the fire there. One such was the existence of the Centralia Drainage Tunnel.

This had been cut decades before to drain higher reaches of the mines and to enable deeper penetration of the coal seams. The major tunnel and its various man-made tributaries breached various potential barriers to the fire,

drained potentially fire-quenching water (scuppering flooding plans) and provided ample ventilation. "Third-mining", the term the report uses for removal of pillars left behind by earlier works, had taken place on several upper levels of the mine network and removed other impediments to the spreading fire.

The routes by which the fire was moving were another factor. Measurements at boreholes across a wide area showed that fire areas were often separated by cooler zones, which would not be expected if the spread were by flames alone. Thus it was understood that hot combustion gases were igniting disparate areas to expand the frontiers of the fire.

Toxic: smoke rising from the ground above the underground fire in 2006. Photo source English Wikipedia/user Jrmski

Centralians at risk

Hitherto we have considered mines, underground features and fire. It is likely that relatively little effort would have been expended in writing about all of this however, were it not for the fact that about 2,000 people living above had their lives turned upside down as a result.

The first indications of grave risk to the inhabitants of Centralia emerged around 1969. It was then that high proportions of carbon dioxide were found in several homes, together with depleted oxygen levels. Of greatest concern was the presence of carbon monoxide, a product of incomplete combustion which binds to haemoglobin in the blood. In so doing it prevents the carriage of oxygen by affected red blood cells.

Odourless and invisible, it is quite literally a silent killer, detectable only with specialist equipment which in the 1960s and 1970s was somewhat more expensive and bulky than the cheap and convenient detectors we have in our homes today. This was installed in several homes to warn inhabitants of the lethal gas building up in their basements with bells or buzzers so that they could immediately ventilate their living quarters. In June 1979 high levels of carbon dioxide and other gases were detected in the homes of John Coddington and David Lamb. The following year alarming levels were detected near St Ignatius School on Locust Avenue.

Temperature monitoring: Dept of Environmental Protection reading from about 10ft down, March 2007. 187 Fahrenheit is 86 Celsius. Photo source English Wikipedia/user Mredden

A pertinent illustration of the dangers arising from heat rather than gas came in December 1979. John Coddington, a fuel station owner and erstwhile mayor, was dipping his tanks to check levels and found that the fuel was very hot. It was measured at nearly 78 degrees Celsius. He closed the fuel station.

A more startling harbinger was yet to come. On Valentine's Day 1981 a thirteen-year-old Centralian named Todd Domboski was playing in his grandmother's garden and went to investigate a patch of steam rising from the lawn. A sinkhole opened up beneath him and he went down, but fortunately was able to hang on to a tree root near the surface. His friend nearby managed to lie on the ground and haul him out. It was as vivid as possible a demonstration of how the mine fire was becoming a matter of life and death for residents.

By great coincidence it happened on the day that Congressman Nelligan and officials from the Dept of Environmental Resources were visiting Centralia and measuring carbon monoxide levels. The boys found the group and told them of the near-miss, and it received a great deal of news coverage. Todd was reported as saying "The smoke was so thick I couldn't see anything … I was only in there a minute, but it seemed like an hour." The detectors found levels of carbon monoxide above the opening that would undoubtedly have killed the boy within minutes.

The potential lethality of this troublesome gas was again highlighted on 19 March 1981 when the unfortunate John Coddington collapsed after being overcome in his home and was taken to hospital. Later he spoke of its dangerous effect on consciousness, describing how "you're looking at TV; next thing you know an hour and a half has gone by and the program is over."

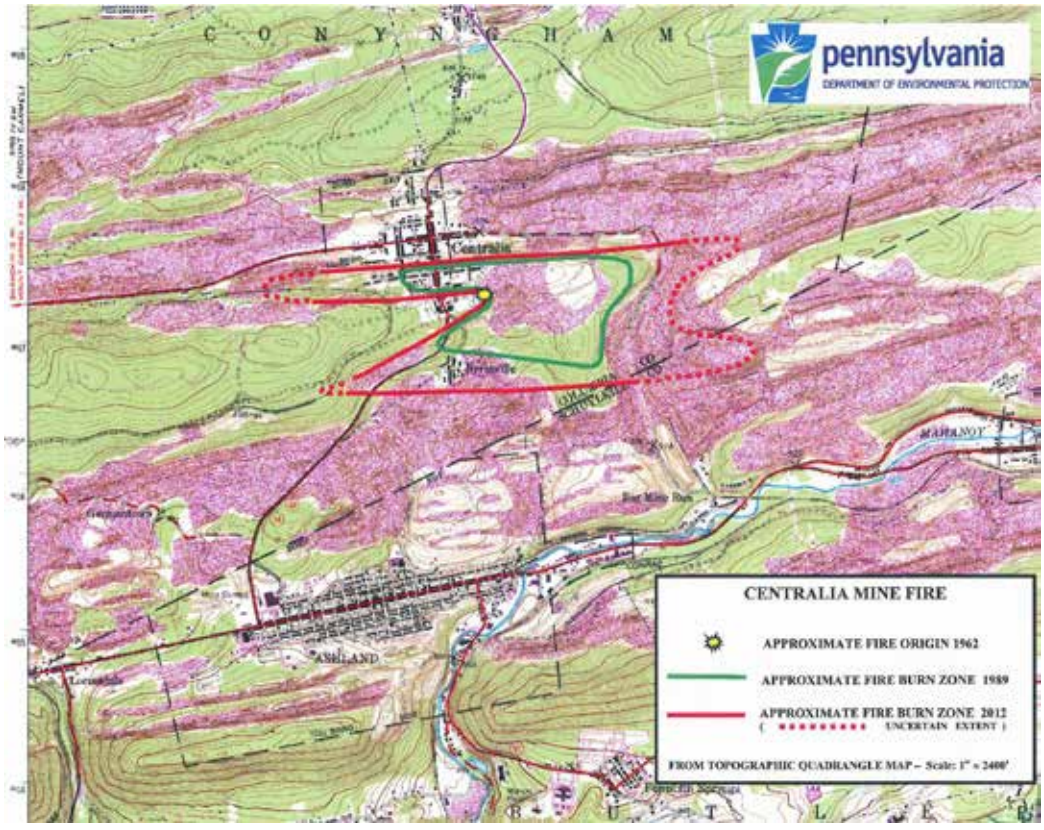
Despite what seem to us now to be clear dangers, new residents were still moving to Centralia. Tom and Christine Oakum bought a house on Centralia's main street in 1975 and were told the fire was moving away

from them. By 1981, having been horribly misinformed, they were equipped with gas detectors and Mrs Oakum was reflecting, "Suppose someone isn't protected from the gas and gets a headache: the natural thing for them to do is take a couple of aspirin and lie down to rest. It could be their last rest."

Her campaign of writing letters to the government was not without fruit, for the Secretary for health wrote back with invaluable advice not to allow her children to sniff the cracks in the floor. Such helpful guidance was available in abundance in Centralia; when John Gadynski moved with his family into South Street in 1978, they were told that the area would be safe for a hundred years.

Leavers and remainers

As the danger came into sharper relief in the early 1980s, so did the divides forming in the community of Centralians, with a vocal minority refusing to accept the truth of the risks and developing conspiracy theories. One of the more prominent 'deniers' was Helen Womer, who refused to have gas detectors, saying, "We're not afraid of the gases, and we're not going to become slaves to a machine." She maintained until her death years later that there was a plan to destroy Centralia borough as a legal entity so the State could move in and make billions from further mining.


pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
CENTRALIA MINE FIRE
APPROXIMATE FIRE ORIGIN 1962
APPROXIMATE FIRE BURN ZONE 1989
APPROXIMATE FIRE BURN ZONE 2012
(UNCERTAIN EXTENT)
FROM TOPOGRAPHIC QUADRANGLE MAP – Scale: 1" = 2400'

Mine fire spread map, 2012, by Pennsylvania Dept of Environmental Protection

On the larger side of the divide, townsfolk began to push for relocation. In 1981 "Concerned Citizens against the Mine Fire" was formed and lobbied for the authorities to assist locals in moving to safer places. Considerable efforts by campaigners began to stir the lethargic machinery of state and federal government into some momentum and in July 1983 the results of a new study were announced. The mine fire was confirmed to be now under the town and covering at least 195 acres. At this stage it was determined that total excavation of it would cost $660 million and destroy large residential areas.

Buttressed house in Centralia, no longer supported by neighbouring houses. Photo Flickr/Jessie Hart

A non-binding referendum was held in 1983 and 86 percent of voters wanted to be relocated. The federal government approved funding of $42 million to commence the Centralia Mine Fire Acquisition Relocation Project. Voluntary relocation began, and those who asked to go were paid a fair market value (pre-fire) and relocation expenses.

When a block of houses had been vacated, they were demolished and the area landscaped. Sometimes individual properties whose owners would not move were left isolated and required buttressing to support them after those adjacent were demolished.

Push comes to shove

After 1983, relocation gathered pace. The prices paid did not, and some in the government seemed to feel that the unfortunate residents should be glad to get anything at all. By 1990 the remaining occupants of Centralia numbered 63, over 1,000 people having moved out and 500 buildings having been demolished.

Those staying behind were ever more diehard Centralians who did not accept that the underground fire posed a risk to their health and safety. Soon the final death throes of

the community and town began. For decades the State had vacillated and procrastinated about the problem in Centralia, but with the overwhelming majority of homes now empty and their former owners safe elsewhere, Governor Robert Casey grew impatient with the remaining residents.

In 1992 he declared 'eminent domain' over the remaining houses, the legal right of the State in the US to take ownership of land and property for reasons of public good. Those still living in Centralia now no longer owned their homes and they were earmarked for eviction.

For residents who had thus far avoided being pressed to depart their hometown, eminent domain was not the end of the story. They began a series of legal challenges that went on for further decades. Nonetheless, in 2002, one hundred and thirty-seven years after it was granted, the ZIP code for Centralia was withdrawn by the US Postal Service.

By 2006 just sixteen properties were still standing. By 2010 there were just five still occupied. The few remaining residents battled on, trying to retain ownership of their land and the right to reside there. In October 2013 these actions were finally settled when it was agreed that those still inhabiting Centralia would be allowed to remain until their deaths. Upon their passing, eminent domain would take full effect and their homes would be razed.

At the time of writing there are thought to be just five or six people residing in Centralia. Their lives are lived under the glare of tourists as their near-ghost town is the sixth most popular tourist destination in Pennsylvania. The closed section of Highway 61 south of Centralia, shut down in 1993 after it started to crack and crumble above the fire, became the famed "Graffiti Highway" until it was covered over in 2020.

Road damage and graffiti on the abandoned section of PA Route 61. Photo Brian W. Schaller

Reflections

It seems a fitting time to write (and, I hope, for you to read) about what happened to Centralia. As I prepared this article, the COP26 summit was taking place. Representatives of governments around the planet debated measures to minimise global heating and its effects, caused by carbon dioxide released from burning fossil fuels since the industrial revolution.

Readers of this journal may be especially aware of the profound influence of coal extraction on the landscape, and the countless places where it ended with little or no mitigation of the danger posed by the remains. To quote David DeKok, "Centralia and its mine fire symbolise the folly of the notion that man can abuse the environment without consequence."

The story of Centralia represents in microcosm many of the themes relevant to the current environmental crisis: industrial extraction of fossil fuels with little heed to how the land is treated during or after; bureaucratic quagmires and aversion to spending money to address problems; and above all indifference to the wellbeing of the 'little people' suffering the direct effects of it all. Senator Edward Helfrick reckoned he was within $5,000 of extinguishing the fire before he had to rebid for funds.

In the end it cost over $40 million just to relocate the residents of Centralia. If there is a lesson here – and there really should be, from all that has happened in Centralia since 1962 – it is that *what we do underground* affects the environment and unavoidably in turn affects human lives, and we must consider this at the outset of any endeavour. Any later is too late.

Reflective graffiti on the Graffiti Highway. Photo Flickr/kjarrett

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DeKok D daviddekok.com/centralia-mine-fire/

State of Pennsylvania:

Centralia monitor location map: tinyurl.com/4y4z7t8x

Fire location map: tinyurl.com/y5tfhmjh

Centralia FAQ: tinyurl.com/a7apxu2n

Szczecin Shipyard Air-Raid Shelter, Poland

Tim Wellburn

Deep in the bunker an 'L'-shaped suite of rooms (designated "A2") appears to have been the control centre for the complex. Although the fittings and contents are extant, humidity and lack of ventilation in this area has caused considerable decay

"*You will be the first foreigners to visit this bunker since the NATO inspectors; bring wellies!*"

So read one of Richard Hill's intriguing progress bulletins during the planning of a recent foray into Poland. For those of us who like their bunkering dark, unmapped and abandoned, this site proved to be one of the highlights of our trip.

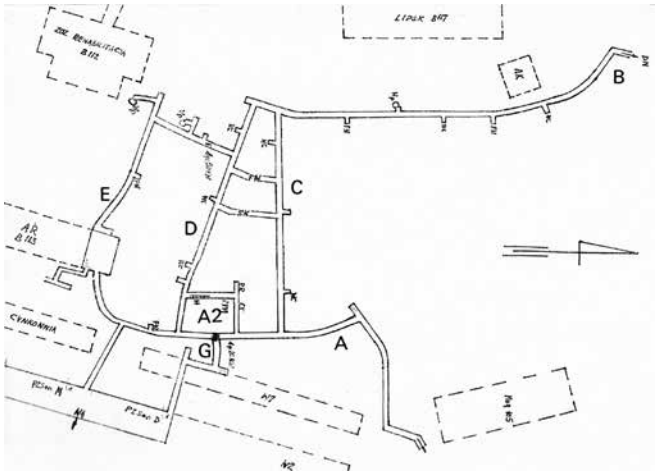
A (very) brief history of the city

Szczecin is a major seaport, situated on the River Oder in northwestern Poland, a short distance from the Baltic Sea and even closer to the German border. The capital of the Duchy of Pomerania in the 12th century (originally a vassal state of Poland), the city was to pass through many hands until 1720 when, as Stettin, it was absorbed into Prussia, thus becoming part of the new German Empire in 1871. Weimar Germany retained control of the city after the First World War, in which period the port ranked behind only Hamburg and Bremen in size and importance.

Post-WWII (and contrary to the what was envisaged in the Potsdam Agreement), the Soviets carved out some land on the west bank of the Oder to place the city in Poland, again as Szczecin. However, its former name may carry greater resonance, immortalised as it was in Churchill's famous Fulton, Missouri speech in March 1946: "*From Stettin in the Baltic to Trieste in the Adriatic, an iron curtain has descended across the Continent.*"

Training aids in a Civil Defence classroom. If all else fails, don a blond wig?

Stettin was once Germany's third most important seaport; the post-WWII border was redrawn to assign the city to Poland

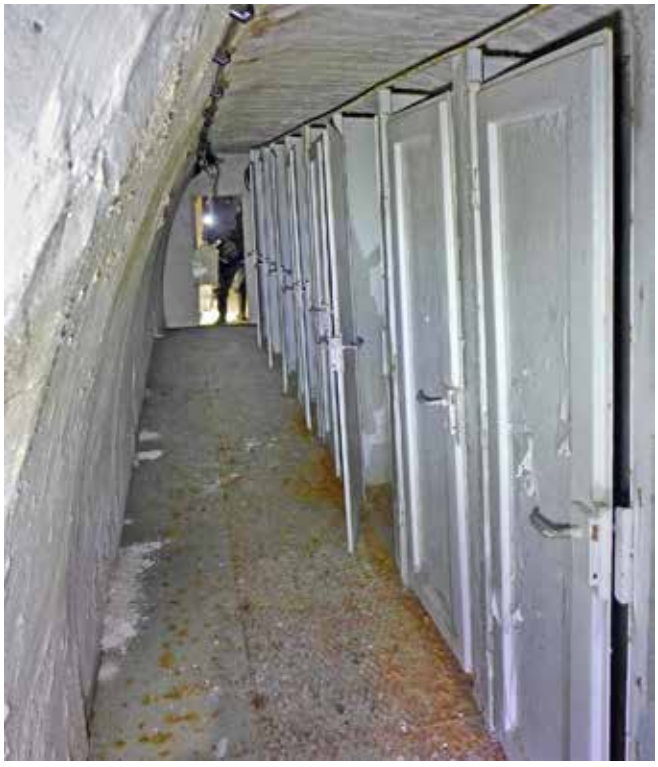


The plan of the bunker, obtained after our visit. (The tunnel letter designators have been added by the author.) We entered the system from the block labelled 'AR B113' on the left-hand side of the plan

The Bunker

The air-raid shelter was constructed within the Stettin shipyard, during or pre-World War II, to provide protection for the workforce. It is said to have been designed for 2,500 people, accommodated within its 1.7 km of tunnels. At the time of our visit we had no plan of the bunker: the one reproduced here was obtained later by Richard Hill.

The complex has a main axis running approximately N-S, roughly parallel to the quayside, from which it



The suite of WCs in the dead-end passage. Note the tunnel's archaic profile

is set back a couple of hundred metres. Changes and additions appear to have been made to the bunker's structure in the Cold War period, when it was also used for Civil Defence training, a commonly related function in this period.

We go exploring

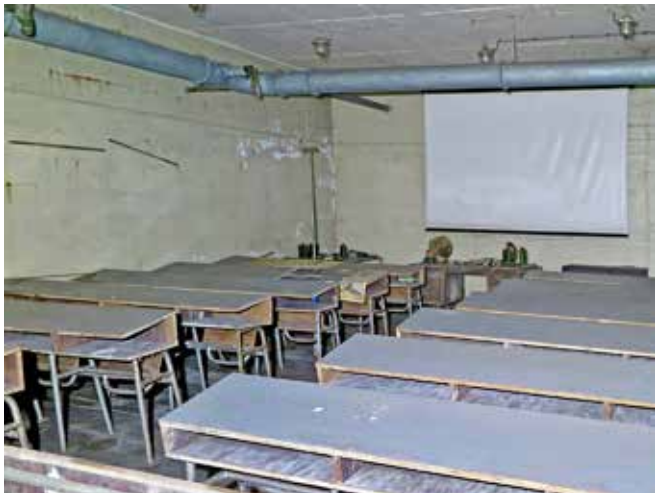
Behind an unassuming steel door, set within a vehicle bay of an industrial/office building, a post-WWII concrete stairwell descended three or four flights. At

The southern entrance to tunnel "A" – although its designation, nature and destination were then unknown to us

the bottom, with no notion of the bunker's form or extent, we set off down a promising and clearly older section of tunnel with a distinctive arched profile. After negotiating a series of steel (airlock?) doors we reached a junction, beyond which both tunnels came to a dead end, albeit one of them generously equipped with WCs. Returning to the foot of the stairwell, we then followed a more modern, rectangular-section tunnel in which we passed a red-lettered enamel sign, readily translated, using our newly-acquired Polish, as: "Unauthorised Persons Are Prohibited". This was encouraging – especially as we were authorised! Beyond this, a further choice of routes presented itself.

To the right, lay the gated (but open) portal of another older, arched tunnel, curving away into the darkness. To the left was a corridor with rooms opening off on both sides. Here the party split into smaller groups to probe different parts of the unknown. I headed for the rooms.

The Cold War suite of rooms



One of the relatively modern suite of rooms off Tunnel E, used as a Civil Defence classroom. Photo Clive Penfold

Judging from its construction, this part of the bunker must have been a Cold War addition to (or updating of) the original German air-raid tunnels. A series of interconnecting rooms on the left-hand side evidently had been used for Civil Defence training. Helpfully for dating purposes, a paper-strewn office retained a 2008 wall calendar (showing a lady who seemed to have lost her clothes, perhaps in an atomic blast?). The classrooms contained instructional material, including anatomical models, respirators and various official posters.

Civil Defence poster with an eclectic mix of advice for "Hardening the Body"

"How to Behave in the Event of an Unexpected Nuclear Explosion" – another of the posters in the Civil Defence training area – although this one has a distinctly military slant

The posters, more of which also lined the corridor, deserved study for their helpful advice – delivered in the customary Soviet 'comic book' style. These covered such subjects as: *Hardening the Body; Prevention of Infectious Diseases of the Gastro-intestinal Tract;* and *How to Behave in the Event of an Unexpected Nuclear Explosion*. The advice in this last eventuality generally seemed to be to lie down. We refrained from practising any of this instructional wisdom.

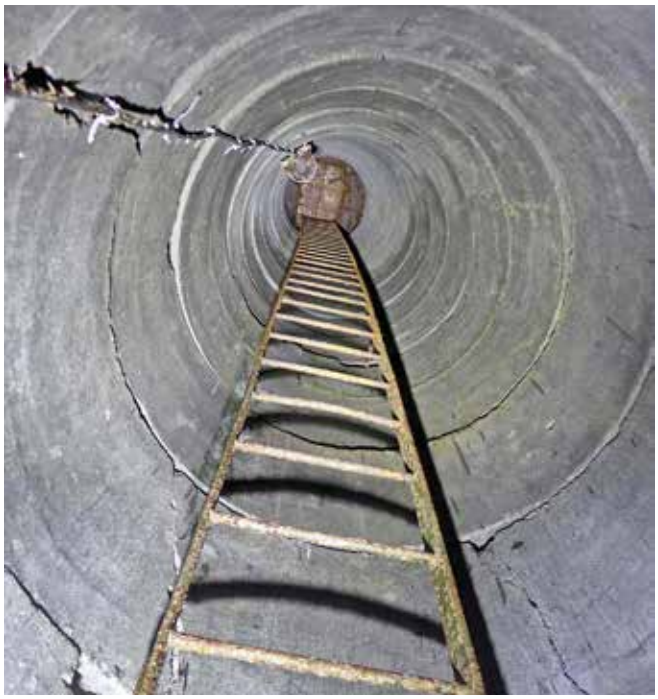
The air filter room – seemingly still in operational order

The rooms on the other side of the corridor included technical facilities such as an air filter room – which was in near-pristine condition. A hand-crank could be turned, driving a fan and producing a noise that seemed to please some practitioners. An adjacent workshop looked as if the (untidy) occupier had simply walked out for lunch and not returned.

Beyond this suite of rooms lay, on first encounter, a seemingly disjointed pattern of largely old-profile tunnels, all lined with fold-up wooden-slatted benches. Short spur tunnels gave access at two points to emergency exits.

The workshop orderly should be put on a charge

These comprised a vertical ladder set within a circular shaft, the latter seemingly constructed of concrete pipe sections. In due course, after abruptly turning north, we found ourselves at the beginning of another long German-era tunnel, disappearing off into the darkness.



Looking up the shaft of one of the emergency exits

Long tunnel "B"

This tunnel proved to run for a very considerable distance and followed a curiously sinuous course. There was no obvious reason for this gentle meandering: it was not sufficient to check blast; indeed, at intervals, steel doors divided the tunnel into sections. Almost immediately an enticing side passage opened off to the right (ie heading east), but it seemed prudent first to determine the nature and full extent of the 'main' (?) northerly tunnel.

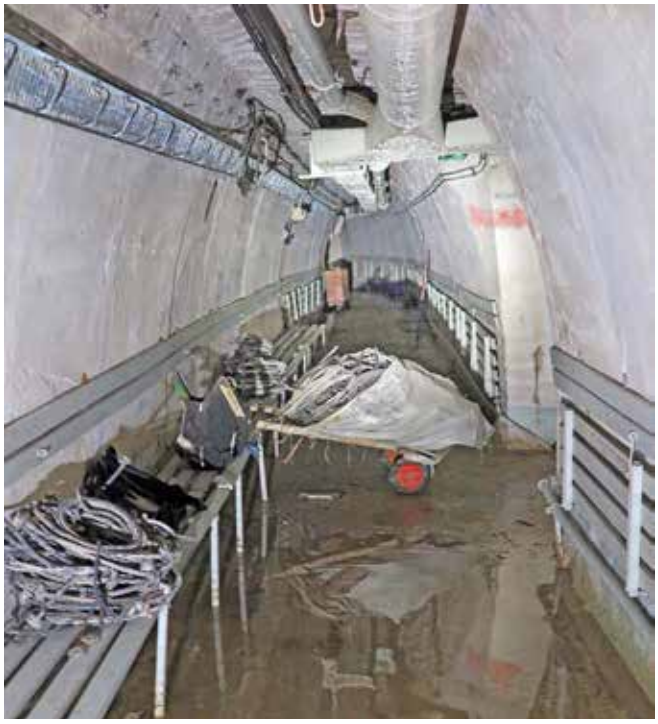
Both sides of this tunnel were similarly fitted with fold-up benches, all painted light grey. A variety of round- and rectangular-section ventilation trunking was suspended from the ceiling, with some cabling running high up along the walls.

One of the frequent lavatory stub tunnels along the course of tunnel "B". In every case, the chinaware remained intact

The emergency exit from tunnel "B". This is marked on the plan as a small circle next to a recess

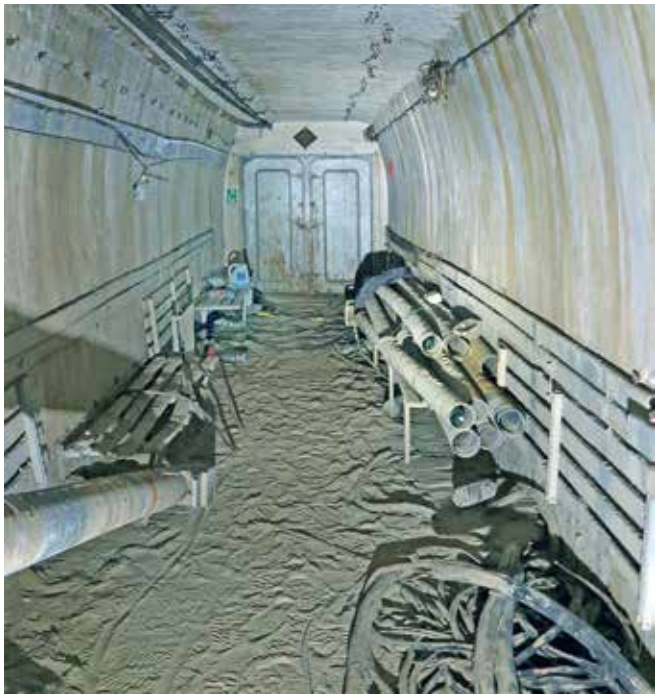
A number of stub side-tunnels, of similar arched profile, so presumably contemporary, contained lavatories. Occasional additional air filter rooms were also provided along the route, although these may have been retro-fitted.

A further set of steel doors protected another emergency exit: again a vertical ladder, here set into old brickwork, with access to the shaft closed off at ceiling level by a steel trapdoor. Beyond this, our wellies came into play as we found ourselves wading through quite a long flooded section.



Emerging from a long inundated section of tunnel, we found evidence of apparent cable theft. Photo Clive Penfold

Here some cable 'recovery' – probably illicit – seemed to have been interrupted. This was the only wilful damage we came across. Other fixtures and fittings had been left intact: even the Russian-made 'tannoy' sets, attached at intervals to the ceiling, had survived.



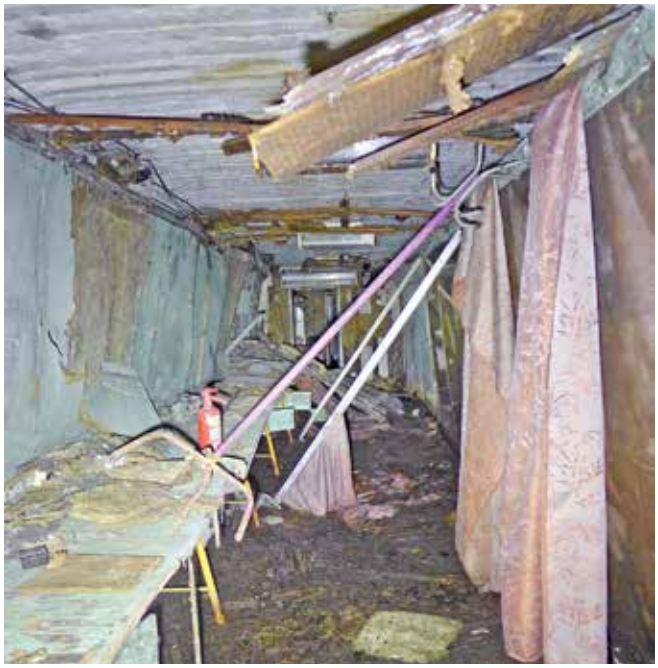
The sealed doors at the northern end of tunnel "B". Photo Clive Penfold

Finally, with a slight opening out of its profile, the tunnel ended at a pair of steel doors. These were sealed, but presumably formed, or led to, an entrance to this end of the shelter system. The letter "B" painted on the tunnel wall provided a possible starting point for deducing the plan of facility. Having thus gained a mental map of tunnel "B" – and, importantly, a known route out of the bunker – the next step was to explore the side tunnels noted earlier.

Lateral tunnels "C" & "D" and interconnecting rooms

The first of these side tunnels – helpfully marked "C" – ran for perhaps 100 metres, ending at a 'T' junction with another tunnel. The latter was on the same broadly N-S alignment as the long tunnel "B", suggesting it might be a second main, long-axis tunnel – perhaps "A" in the bunker's lettering scheme? But first, lateral tunnel "C" – and particularly the rooms opening off it – needed to be investigated.

The bunker's main air filtration plant, located between tunnels "C" and "D"



The map room, with rather incongruous pink curtains still protecting (presumably) once-sensitive information, now all precariously propped up with a coat stand!

Two of these rooms proved surprising. Both were actually wide passageways that ran through to a second lateral tunnel (which proved, logically, to be labelled "D"). Each had a specialist function. The first was a major air filtration plant, containing two sets of different types of air filters, arranged six to each side. The second 'passageway' appeared to have served as a map room but its fixtures were in a state of collapse from the humidity.

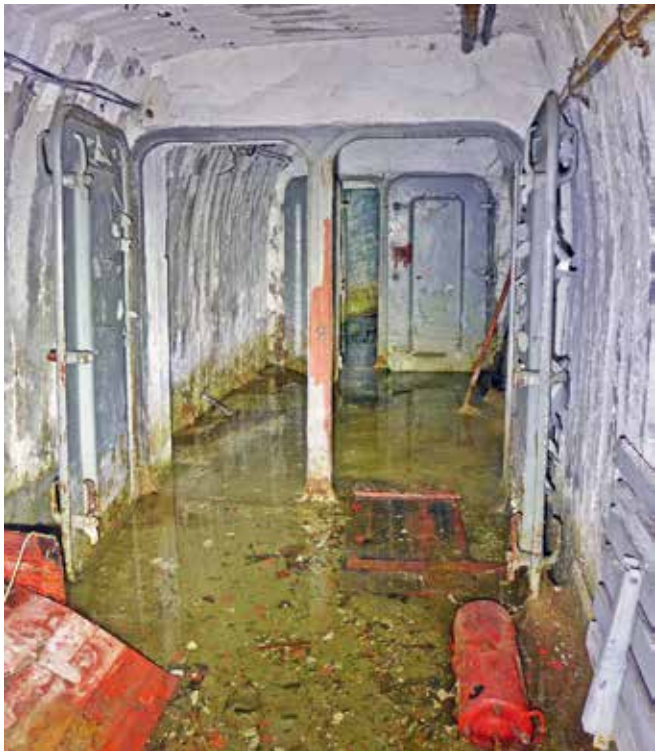
Long tunnel "A"

Returning to the junction with the putative tunnel "A", I turned north to discover if, like tunnel "B", it also ran out to an entrance to the shelter system. After following a long gently curved section, similarly lined with folding wall-benches, this tunnel reached a steel door with an "A" painted on it (hurrah!). However, this was not an exit, but merely an abrupt right-angled junction with another tunnel.

"A" Tunnel curving away south towards the main body of the shelter. On this side of the door a further tunnel heads east, eventually emerging at one of the shelter's main entrances

This next tunnel, which had a rather larger profile, passed through a series of intermediate doors before eventually reaching two pairs of steel double doors similar to those seen at the end of tunnel "B" – and presumably serving as an air lock.

Beyond them a heavier-gauge double blast-door opened onto a shuttered concrete lobby – and daylight! Egress here being precluded by a security grill, I decided to try to return to our starting point by following tunnel "A" back to its origin, which I assumed to be the 'old' tunnel portal seen opposite the office suite.



The airlock located before the entrance blast door – looking west, back into the shelter

The blast doors viewed from the entrance lobby to the shelter's NE entrance

Further discoveries

The not quite state-of-the-art telecommunications hub in area "A2". Photo Clive Penfold

The air filters serving the "A2" suite of rooms

Some way further along tunnel "A" a steel door on the right, marked "A2", opened onto an interesting series of rooms, which seemed to form a self-contained administrative – or perhaps command? – centre (see the headline photo). This had its own set of (slightly rusty) air filters mounted in the entrance corridor, but in the rooms beyond these, time and humidity had produced a state of advanced decay and dereliction.

Nobody seemed inclined to investigate what secrets might have been contained in these files

Steel cabinets held fungal heaps of documents merging into one another; ceilings, wooden shelving and contents had simply collapsed into mouldering piles of debris, discouraging further exploration. (The plan shows these rooms linking through to lateral tunnel "D".)

Amid the debris was an intriguing console, inscribed "Nuclear Weapons" and bearing an illustration of a mushroom cloud. It was fitted with numerous labelled switches covering such things as "types of nuclear explosions", "radiation factors" and so on, each with an associated indicator light. Presumably this was used to signal the type of attack being simulated in Civil Defence training – or, in the event of World War III having broken out, an actual "Unexpected Nuclear Explosion"?

The analogue nuclear attack reporting/signalling(?) console located within the "A2" control suite

The pair of generators located in a stub tunnel at the end of Tunnel "G"

Two further side tunnels ran off from tunnel "A", both heading east. The more southerly of these ended at a set of sealed doors. The more northerly one, labelled "G", appeared similar, but on the dictum that one should never take things for granted underground, it was duly explored.

It proved quite short and, originally, may just have led to another entrance, but it had been adapted for other purposes. In a stub-tunnel at its far end were a pair of generators. The requirement for this incongruously located plant soon became clear.

Decontamination Suite

The most southerly of the suite of rooms of the modern 'medical' facility. Note the bottles of chemicals on the shelf

A 'modern' concrete passage led to a series of large interconnected rooms, orientated broadly N-S and lying at the bunker's southeastern corner. These rooms, clearly a latter-day addition to the bunker, had a distinctly medical feel to them and were oddly equipped with hefty wall-mounted heating pipes. Halfway through the sequence, a large tiled room with twenty ceiling-mounted shower heads revealed this to be a mass-decontamination suite, complete with its own air filtration and hot water systems.

The amply-heated shower room of the decontamination suite

It was intact, indeed, almost pristine, bar a little flaking paint by the hot-water boilers. A wall-shelf still contained bottles of chemicals. At the far end, next to a (sealed) external entrance, was a large wall-mounted plan which described the facility as a "Sanitary Treatment Point". In one of the side rooms, lying on a table, was a newspaper from 2009, suggesting a possible abandonment date for the complex?

The wall plan of the decontamination suite. The title reads: "Diagram of the Arrangement of the Elements of the Sanitary Treatment Point". The main rooms are labelled (left to right): Undressing Room; Shower; and Dressing Rooms I & II

Full circle: Tunnel "A" approaches its southern portal, concluding this exploration of Szczecin Shipyard bunker

Acknowledgements

We are very grateful to Richard Hill for securing permission to visit this remarkable facility, and to the management of the Szczecin Shipyard for allowing us such privileged access.

All photographs are by the author, unless indicated otherwise.

Underground Finland

Hillary Shaw

The author emerges from the protection of the ancient underground shelter at Lappi

Finland: a new country

Finland is a relatively new country, geologically and politically. One thousand years ago, when Sweden and Russia were consolidating as States, Finland was a series of autonomous townships with no central government, so became a contested area between Sweden and Russia, both of whom wanted to control the NE Baltic region. Finland only acquired its modern independence from Russia in 1917, seizing the opportunity to secede during the chaos of the 1917 Bolshevik Revolution.

Geologically Finland is still rising due to isostatic rebound after the last Ice Age, creating navigation problems in amongst its many offshore islands. Today coastal marshes that were evidently fairly recently open sea can be seen off many islands.

The country is fifty percent bigger than the UK, and still getting bigger, but almost all of it lies below 300 metres altitude, giving much of it a rather flat appearance, crossed by many wooded granite ridges. An indication of the flatness of the country is the paucity of rail tunnels in the country's far-reaching, but rather sparse, network.

Despite this topography, Finland does have a number of underground sites, ranging from prehistoric dwellings to road tunnels and defence works, as well as the Helsinki Metro. The Turku area, strategically located on the Aura river estuary in the mid-Baltic, is militarily valuable and has many former defence works, some now repurposed to civilian uses.

Defensive underground spaces: Bronze Age to the Winter War

The interior of the Bronze Age shelter at Lappi

As with many cultures, underground spaces have been constructed from ancient times for storage, protection and (in Finland) warmth. The one at Lappi dates back to the Bronze Age, whilst another in rural Finland (below) is probably just a few centuries old.

The (relatively) more recent shelter seen in rural Finland

More recent still are some abandoned defensive works a couple of kilometres south of Turku centre, in a woodland area in Ispoinen suburb. These bunkers likely date from the Winter War 1939-40, seeing as how their once-commanding view of the Pitkasalmi fjord is now blocked by tree growth and residential flats. They now have a more peaceful use as a canvas for the local graffiti artists.

A redecorated gun position near Turku

The gun emplacement is alongside underground rooms now used as unofficial youth hangouts.

The entrance to the gun emplacement's repurposed bunker

The nearby Aura River estuary at Turku lies in a steep sided valley rising some 50 metres from sea level. The sides of this valley, composed of pink and grey granite, contain more bunker works, some with new road tunnel construction nearby – and one definitely not recommended for anyone with arachnophobia.

The Aura River valley: the new road appears to be usurping the prior dominance of the bunker

The entrances to some military works still remain well defended

Repurposed bunkers of Turku

Turku and surrounding areas contain several extensive bunkers now being reused as, for example, a car park and a leisure centre. The outer suburb of Kaarina, 7km southeast of Turku, has a plan of its former bunker turned youth leisure centre.

A Finnish language lesson

You don't need much Finnish to understand the words *Disco, Musiikkhuone* or *Videotila.* Thankfully, sporting jousts have now replaced military conflict here, but the noise levels may well be almost as high.

The ceiling pipework and ducting clearly betray the former nature of the Kaarina leisure centre

As with all cities, parking space in Turku is at a premium, and another bunker now serves as a two-level underground garage, the P-Louhi, accessed by car from a steep ramp descending downwards cut into the side of another granite ridge off Lantinen Pitkakatu.

The access ramp to Turku's P-Louhi carpark

The ramp descends below the Turku Art Museum, and on the far side has a passenger lift ascending straight into Maariankatu, in the city centre. Because the rock is granite, it can be left unlined in places.

The repurposed P-Louhi bunker

Main roads around Turku

As already noted, the Finnish countryside is marked by a series of granite ridges some fifty metres high, necessitating several short tunnels along the E18 motorway from Turku to Helsinki. It's not possible to stop and take pictures of course, but Google *Streetview* has done the job anyway. One good example is just north of Salo, a town 30 km east of Turku; look on the E18 one km west of highway 52.

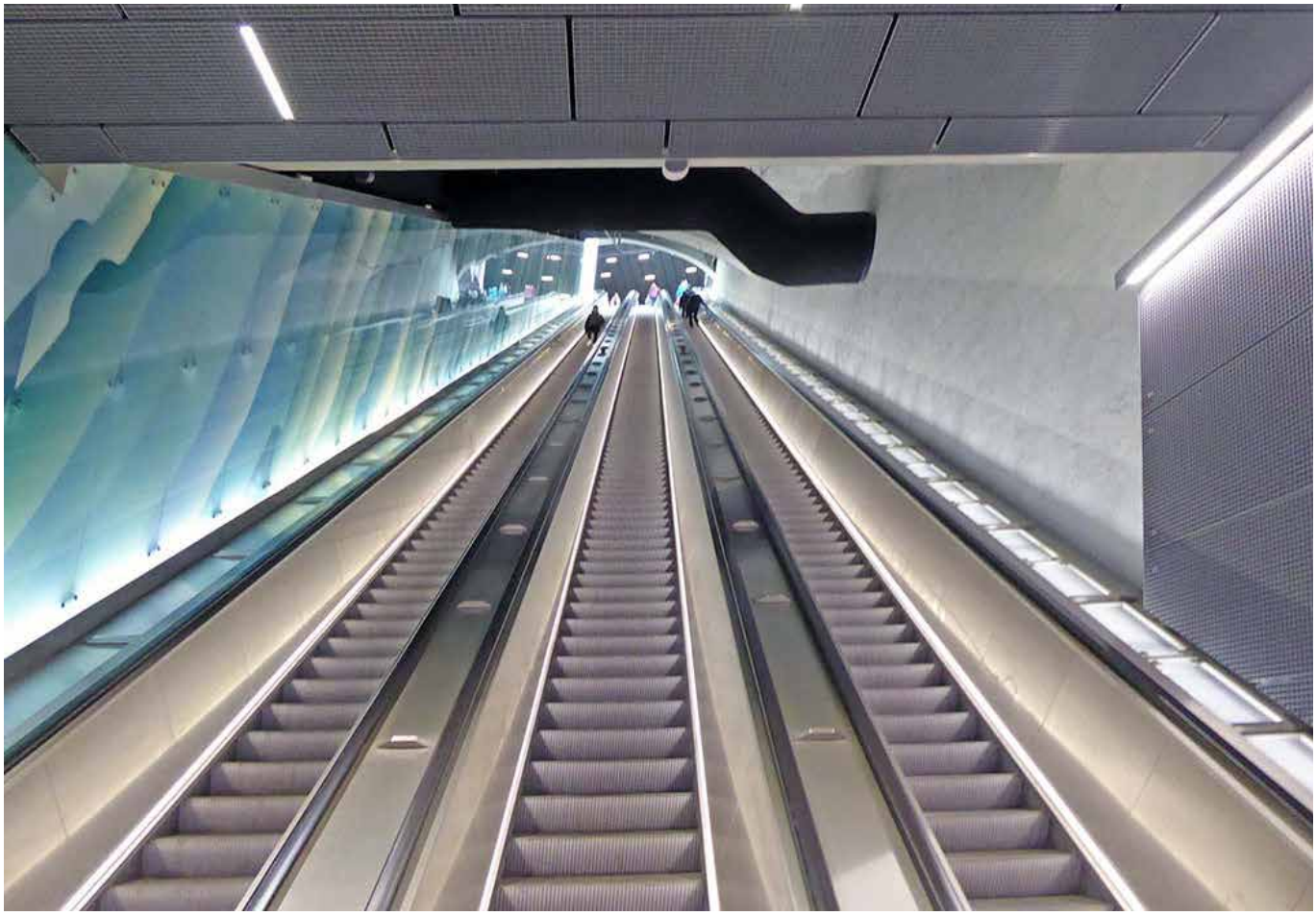
Cleared for take-off!

On other roads one can see that Finland's potential role as a frontline conflict state continues. It is right on the EU-Russian border, and many older towns such as Rauma look like a hybrid between Russia and Scandinavia. Level-straight main roads can also double as military runways if needed (hopefully never), as in this example on the Jyvaskyla highway. Some roads also have evidence of subterranean infrastructure such as water mains.

Underground works by the Jyvaskyla highway

Underground Helsinki

Unfortunately, time for exploring Finland's capital was sadly limited; a future visit is intended. The principal subterranean feature of the city is of course its Metro, which extends under several coastal inlets to suburbs like Espoo. This may account for the deep escalators, here looking up from track to street level. Like the Moscow Metro, however, a deep station also makes a good bomb shelter.



The depth of Helsinki's Metro is evident from the height of the escalators

The Helsinki Metro

Helsinki has a former docks railway branch that is sunk below ground level in a cutting, although not quite subterranean. It departed from the main Helsinki railway 200 metres north of the main railway terminus, ran southwest under Mannerheimvagen and then in a narrow trench alongside Pohjpoinen Rautatiekatu before swinging south and then southeast by Telakkatu.

After the gardens at Mersatamanranta, it served the present-day ferry terminal and docks at Etalasatama Sodra Hamnen. The line can still be traced on Google *Streetview* although modern development is erasing it. Some of the five km route is preserved as a park and walkway.

The entrance to one of Helsinki's underground carparks – although the sign seems to indicate that either road leads underground!

Finally, like Turku's P-Louhi, Helsinki also has underground car parks.

This article does not cover the 'underground city' in Helsinki, and doubtless the rest of the Metro and other intriguing subterranean attractions also await further coverage. The Finnish winter climate creates a big incentive to invest in further underground infrastructure.

Meanwhile Finland continues in its delicate balancing role as a bridging state between East and West, open to both sides and perhaps bringing them together in greater familiarity and understanding.

All pictures are by the author.

The Mount Ice House, Hanworth, Middlesex

Katy Cox

The Hanworth mount is generally heavily overgrown and difficult to see. In 2015 the undergrowth was cleared for the first time in many years. One of two entrances is clearly visible. Photo by Mark Grant

The Mount is the name given to a small hill, or mound, at the corner of Uxbridge Road and Hounslow Road, Hanworth, Feltham to the west of London. It is also the name of the local area in Hanworth.

The Mount has a door at ground level facing southeast and a small concrete opening on the north-facing side. It is in the top right-hand corner of Hanworth Air Park, partly obscured by houses, but easily seen from the main roads. A row of shops, opposite, has adopted 'The Mount' as part of their official name or address, eg The Mount Post Office.

Questions and answers

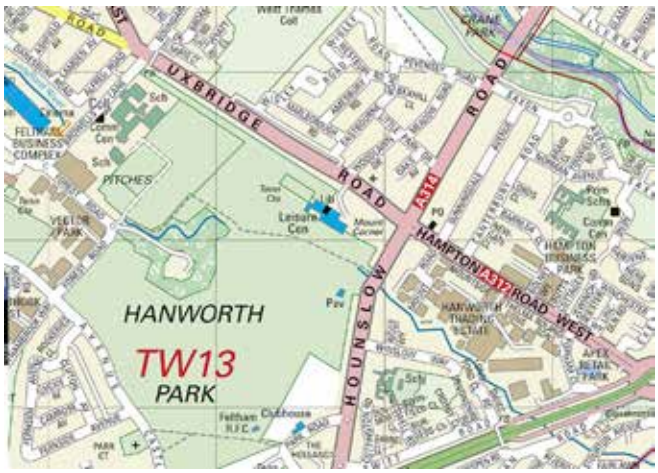
I have questions concerning the history of The Mount but, sadly, no definite answers yet:

1) Was it built as a mound in the 17th century, with an ice house included or added in the 18th century?

2) Was it built as a mound in the 17th century and the ice house added in the 19th century?

3) Was The Mount built to serve as an ice house in the 19th century?

I live near The Mount and it was when I became interested in local history that I started asking questions about its origins. Local knowledge has it that the row of shops referred to as 'The Mount' is named after this small hill, and that inside was an ice house built in the 19th century for Hanworth Park House situated approximately 200 metres distant. The house's owner and the local authority are working together to develop a scheme to bring the house into full repair and reuse for residential and community use under an enabling development scheme.



The mount is shown on many modern maps, being identified as Mount Corner on some street maps

That still didn't answer my question as to why it was named The Mount. More research was needed.

Researching

I always start any new research by looking for information online as there is no point in doing work already done. The first results page gave me this:

"Manor houses often had a mount at the furthest point from their house, in their garden, topped with a summerhouse to give a view back over their park/gardens. Good examples of medieval mounts can be found at New College, Oxford (now covered in

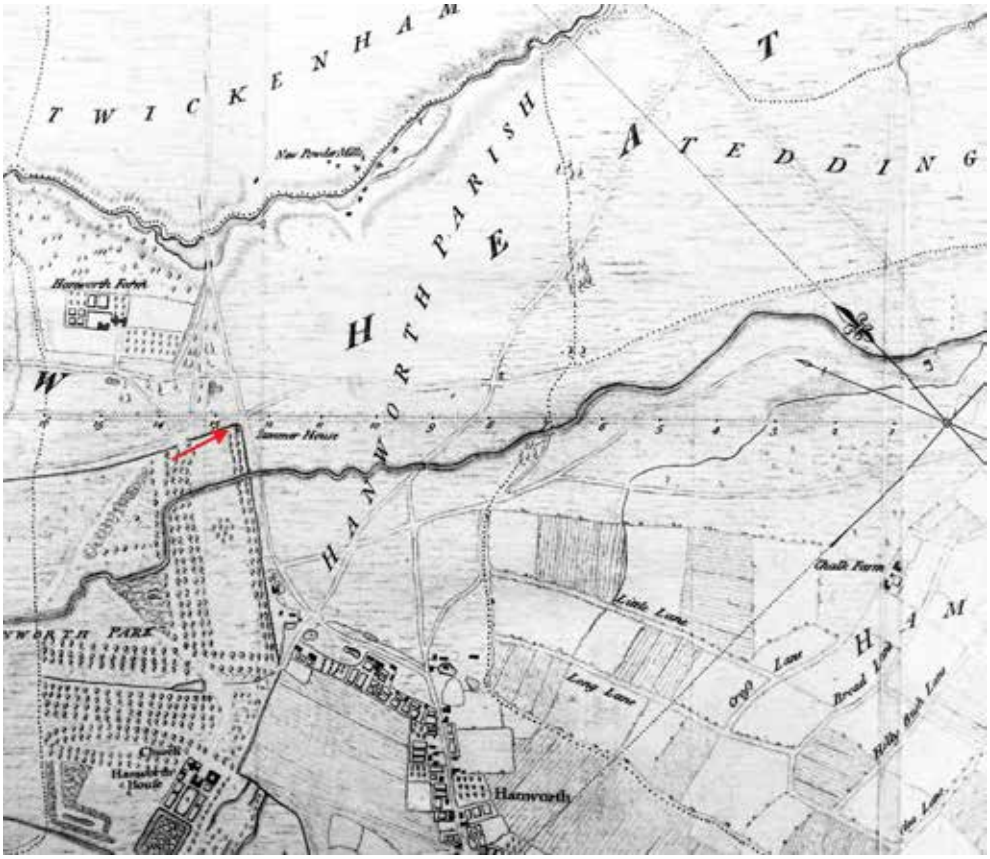
trees and bushes), and Little Moreton Hall. (See David Ross in Britain Express, *Medieval Gardens*.)"

In correspondence with the Greater London Archaeology Advisory Service (GLAAS), I was also sent the following in 2011:

"An extant example can be seen in The Lawn, Swindon, where the ice house mound is topped by a small square building described as a gazebo."

Garden developments

Fortunately I had information from other areas of my research into Hanworth, which I could then link to The Mount. This quotation is from Lord Cottington, the owner of Hanworth Manor and park/gardens in 1629, to a friend, Lord Stafford, informing him of the transformation of the gardens:



General Roy's first Ordnance Survey map in 1784 clearly identifies a summer house where the mount is now located. The summer house is immediately south of Roy's base line for the map.

"There begins to grow a brick wall about all the gardens at Hanworth, which, though it be a large extent, yet will be too little for the multitude of pheasants, partridges, and wildfowl, that are to be bred in it. There is a certain large room made under the new building, with a fountain in it and rare devices; and the open gallery is all painted by the hand of the second Titian. Dainty walks are made broad, insomuch that the old porter with the long beard is like to have a good revenue by admitting strangers that will come to see these rarities.

"It will be good entertainment to see the amazement of the barbarous northern folk, who have scarce arrived, to see a well-cut hedge, when the fame of these rarities shall draw them thither. Certainly they will wholly neglect the sight of Hocus' dog, and Hocus himself will confess that calves with five legs, and the puppets themselves, will be nothing in comparison of this sight. My wife is the principal contriver of all this machine, who, with her clothes tucked up, and a staff in her hand, marches from place to place, like an Amazon commanding an army."

This is recorded on the *british-history.ac.uk* website on Hanworth.

House destroyed

Hanworth manor house was next to St George's Church, fronting the park/gardens, which stretched to The Mount, about half a mile away. (The house was totally destroyed by fire in 1797.) Would Cottington have built a mount, at the top right-hand corner of his gardens, to look back over his wife's work, and top it off with a summerhouse for when the weather was inclement? Did they then utilise the mount as an ice house/food storage?

Not long after the gardens were built, in 1637, King Charles I ordered the construction of the [now named] Longford River. It was designed to carry water from the Colne river, and flows from Longford, near Colnbrook, through Hanworth Air Park to Hampton Court Palace. (See The Royal Parks *Water Features*.) Its course is near The Mount. It is not very deep nor fast-flowing, therefore it would seem plausible that the water would easily form ice during cold weather, to be stored inside The Mount in an ice house. The Mount is next to a road, therefore road deliveries of ice would be easily accommodated.

Roy's survey

The only mention I have found, so far, of a 'summer house' is on the first ever Ordnance Survey map. The survey was undertaken by General Roy in 1784. The word 'summerhouse' is written on the map in the exact location of The Mount. It also shows how close the Longford River is to The Mount.

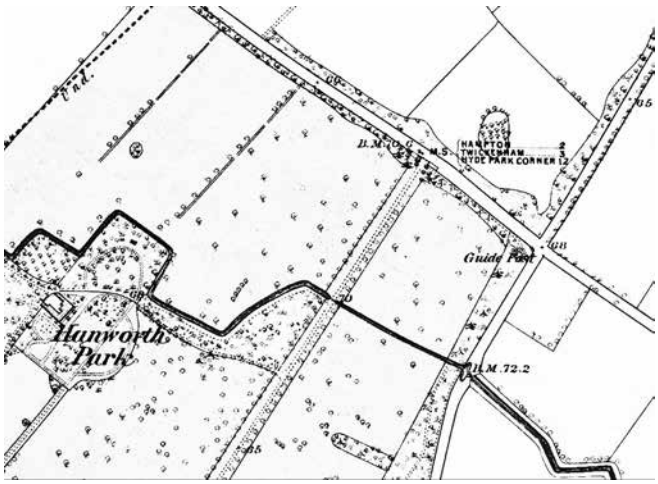
The Survey started at the northwest of Hounslow Heath, through Hanworth Park, with the summer house as part of the base-line, and ended at Hampton Poor House.

This is just one mention of a summer house in Major General Roy's book:

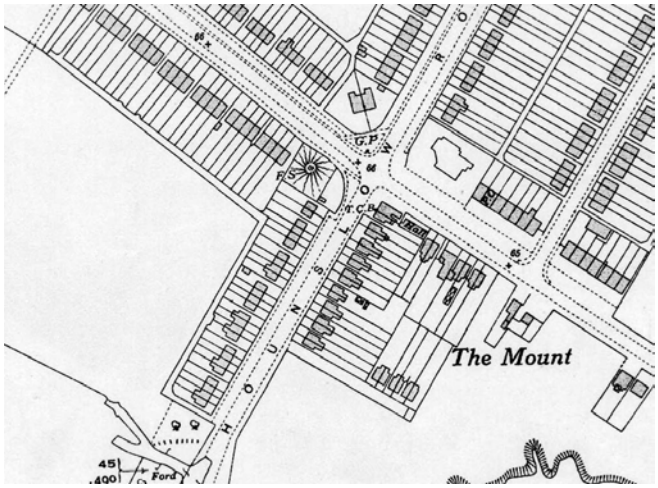
"Accordingly a party of the 12th regiment of foot, consisting of a sergeant, corporal and 10 men, were

ordered to march from Windsor to Hounslow Heath where they encamped on 26th May, close by Hanworth summer house, to which spot the necessary tents, camp equipage, and entrenching tools had been previously sent... The first point therefore to be attended to, in tracing it out, was that it might lead straight through this pass, without interfering with certain ponds and gravel pits full of water, which are in it. These were easily avoided by carrying the line pretty near to Hanworth summer house…"

Thus Roy's first action was to measure a Survey baseline across Hounslow Heath during the summer of 1784. This is commemorated in the Ordnance Survey web blog *Gemma* of 4 November 2013 titled "Heathrow Airport honours the work of Major General William Roy."



The mount is clearly shown on the OS 6" first edition, published in 1871 and surveyed 1864-68



1936 1:2,500 OS map shows substantial residential development and this part of Hanworth is now known as The Mount. The mount itself is now shown as a symbol. FS indicates a flag staff but this might be an error by Ordnance Survey and is probably a windsock following the arrival of the National Flying Services in 1929.

And The Mount?

There is no mention in Roy's book of the summer house being on a mount. However, there would be little point building the summer house in that remote position on the estate unless it was in a position to look down over the estate, so it is fair to assume it would have been on a mount.

There is mention in 1801 of an ice house in an advertisement for an auction of a villa in Hanworth Park. Here it is, word for word:

"A Singularly elegant LEASEHOLD VILLA, with roomy Stabling for 13 Horses, Coach-houses for three Carriages, and Offices of every description, verdant Lawn surrounded by thriving Plantations and Pleasure Grounds, capacious Fish Ponds amply stored, Cold Bath, Ice House, Green House, and extensive Kitchen Garden, subdivided, and partly inclosed by a lofty South Wall, Peachery, Pinery, and Succellion House, Melon Ground, and rich Paddocks, in the whole about eight Acres, exclusive of Gardens and Buildings, called HANWORTH HOUSE, delightfully situate in the centre of Hanworth Park, which is well stocked with Game, distant two miles from Hounslow and Hampton, three from Twickenham, and 12 from London, in the county of Middlesex."

(From *Morning Chronicle* Sales by Auction 21 July 1801, as seen in the British Newspaper Archive.)

Confirmation

The next mention of an ice house is in the 1873 brochure for the sale of Hanworth Park and House, wherein it states '**an ice house beneath a large mound at S.E. of estate**', as recorded in *The London Metropolitan Archives* as 'The Mansion – Hanworth Park DRO/018/H/02/025. That is the first written confirmation of an ice house being in The Mount and it acknowledges the existence of a mound! (Hanworth Park House was built in the late 1820s and was then surrounded by parkland. It is now on the edge of Hanworth Air Park.)

Hanworth Air Park from the east in 1929. The mount is obscured by trees. Photo from Britain From Above, reproduced with permission

Are there any descriptions of what is inside The Mount? Yes.

On the inside

Since I'd put my research on hold there has been this addition in 2020 by the Greater London Archaeology Advisory Service (GLAAS), Historic England. They

do stress that the information they have is not through their own research but from information deposited with them:

> "Formerly in the grounds of Hanworth [Manor] House (which was rebuilt in 1797 as a small villa). The ice house probably dates from earlier than that and may have belonged to the previous house on the site. Access to the interior of the ice house was blocked in the early 20th century when the surrounding houses were built. **If it survives, the interior should consist of a brick-lined and vaulted chamber** covered over with earth and reached by a short tunnel-like entrance. It is a particularly large example of the type and would be impressive when viewed from the inside. It would be capable of storing a large amount of ice. On Sir General Roy's map of 1785 a 'summer house' is marked at the edge of the park of Hanworth Manor, in the location of the ice house. The summer house probably surmounted the ice house structure."

The above is available from the archeologydataservice.ac.uk website.

The mention of the ice house being brick-lined is confirmed by information I received from Hounslow Local Archive Team (S Ferdousi by email), which states:

> "Hanworth's ice house is an earthen mound with a brick-lined cavity."

The mount seen from the southeast corner of the air park in 1934. It is clear from the photo that the mount was considerably higher in 1934 than it is now. Photo from Britain From Above. Reproduced with permission.

Ice house details

There is also a detailed description in a book on Hanworth local history by Wright and Finnis (Wright, JEBC & Finnis, JHB. *A Book of Hanworth*, pp74–75):

> "The mound, which has given a name to that part of Hanworth, is **a vault some eight feet by eight feet, built of stock brick, the floor being of staffords**, and had a 3-inch thick oak door which was removed sometime in 1941 when the place was used as an air-raid shelter.
>
> "Built around 1865 by Algernon Perkins of Hanworth Park, this mound was nothing more than an ice house or cold store, in order to maintain a temperature somewhere near freezing, all year round. Snow was gathered in the winter, compressed into blocks of ice and packed into the ice house. If the winter was mild, ice would be bought in.

[**Author's Note**: *There are no records, as yet, to suggest Algernon built the ice house – he may, though, have refurbished what was already there.*]

> "The walls of the vault are about two inches thick and bonded with lime mortar and coated with a lime wash, covered with soil eight to ten feet deep. The mound was then planted with trees and shrubs, firstly to prevent the rain from washing down the soil, and secondly, to prevent the sun's rays from penetrating into the ice house. By this massive insulation ice gathered in the winter stood a very good chance of lasting until the next summer.
>
> "By the 1890s The Mount, in name at least, had come to stay. For a Mr Styles, who was the head gardener of Tudor House (next to St George's Church) in those days, had built, in the Hounslow Road, some cottages, which he named Mount Pleasant. It would therefore seem in some measure, that Mr Styles was responsible for the naming of this part of Hanworth and was obviously inspired by the ice house, resembling a small mount."

Although, we note, there are many places in the UK named Mount Pleasant.

Types of Brick

Note the GLAAS mention above, that if it is brick-lined, it would denote an ice house built before 1800. The description from Wright and Finnis confirms that it is brick-lined by including details of the types of brick used inside.

Perhaps you are thinking that an archaeological survey would provide answers. Yes, good thinking. I have received a quote from Wessex Archaeology to carry out research, but not yet received permission from Hounslow Council since my first enquiry in 2016.

A glider flies over the mount seen from the southeast corner of the airpark possibly taken Jan/Feb 1931 during the Lowe Wylde Tow Gliding Trials. Note the trees have been pruned presumably to restrict their height due to low flying aircraft. Photo from Tony Fredjohn of the Feltham History Group

I am trying to keep any bias out of my observations and sincerely hope that in the not too distant future Hounslow Council will give the go-ahead for archaeological research to determine the age of The Mount and/or the ice house.

Editor's note:

Although the Mount at Hanworth has been described as an ice house from as early as 1801, it is clear from the limited internal description in Wright and Finnis' *A Book of Hanworth* published in 1991 that the Mount does not in any way resemble a typical ice house. This is described by Sylvia Beamon as "A dome or vault covering an ice well, usually built of masonry, with sides sloping inwards and downwards to a sump or drain at its base."

Sylvia Beamon also says however that "Ice houses were built in a wide variety of shapes, sizes and materials" and her definitive book *The Ice Houses of Britain* uses the term 'ice house' for any building used for the storage of ice. So although the Hanworth Mount is not a conventional ice house it could well have housed a cold store.

People and events at Hanworth Park and House from 1507 to 2022

Hanworth Manor House, next to St George's Church:

1507 First mention of a Manor House at Hanworth, so far, is of Henry VII making a garden there (as reported in Tatton-Brown, T & Mortimer, R. *Westminster Abbey, The Lady Chapel of Henry VII*, Boydel Press, Woodbridge, 2003). It then passed to Henry VIII, and then through various hands until it was destroyed by fire in 1797.

Hanworth Park House was built in the middle of the park, in the late 1820s. It is now Grade II listed, at the edge of Hanworth Park. The owner and Hounslow Council are working together to develop a scheme to bring the house back into full repair and reuse.

1820s–1872 Owned by Henry and then Algernon Perkins

1883–1915 Owned by Alfred Lafone

World War I Used as an auxiliary hospital

1916–1920s Owned by John Whitehead

1917 The Longford River was culverted north of the House as part of London Air Park

1926 Aston Martin established at Feltham/Hanworth

1929–1934 National Flying Services bought Hanworth Park House and land

1929 Established as a clubhouse

1932 Cierva Autogyro Co manufacturing and Autogyro Flying School established at Hanworth

1935 Hanworth Park Hotel established

1935 General Aircraft moved to Hanworth

1937 The Longford River was covered with concrete as part of Hanworth Aerodrome

World War II Aircraft were sent to Hanworth to be repaired or modified and then flown out again by the Air Transport Auxiliary. The Mount is used as an air-raid shelter and lookout post

1940s Hanworth Air Park becomes public space

1950s House became a nursing home

1990s to present – house empty.

Henry Perkins was a partner in the famous brewing company: Barclay, Perkins & Co, having inherited shares in the company from his father, which **Algernon Perkins** then inherited on Henry's death. The brewery, based in Southwark, was, in the early 1800s, the largest in the world with the highest output. It continued to trade until the 1950s. While at Hanworth Henry had amassed a small (by some standards) library, which was the envy of many bibliophiles not only here but also on the continent. We know of its existence as the entire library was also put up for auction in 1873, and the auction catalogue can be found online. An example of some of the sale prices are the final two lots: two copies of the Gutenberg Bible, one on vellum and one on paper. Lot 864 sold for £3,400. The relative value today would be over £300,000. Lot 865 sold for £2,690, the relative value today of which would be over £234,000.

Henry Perkins was a founder member of the Thames Angling Preservation Society, at a meeting held in The Bell, Hampton. He was also involved in advancements in agricultural techniques, and was a member of various committees, associations and scientific societies, which is reflected in his collection of reference books.

Both Henry and Algernon Perkins must have been very fond of Hanworth for Henry, in 1848, gave land in Hanworth for the building of a school. During Algernon's time as the owner he paid for a new design and work on St George's Church, and added two wings to the house plus a veranda and clock tower. (See *The Perkins of Hanworth Park* in the *Sidetracks to History* series.)

Alfred Lafone MP was a leather merchant and Conservative Party politician in London. He was the Member of Parliament for Bermondsey and a Justice of the Peace.

The early days of flying at Hanworth

1915–1947 There were two aerodromes at Hanworth, one named Hanworth Aerodrome, now Hanworth Air Park, and one named London Air Park, now under the CineWorld complex.

World War I to 1947 Hanworth was home to various aircraft manufacturers, flying schools (both civilian and RAF), and air taxis. Not only aeroplanes were manufactured at Hanworth but also autogyros and gliders.

Many famous air races were staged at Hanworth, and also air pageants, air displays and aerial circuses. Aviators would fly, for fun, between Brooklands and Hanworth for lunch or dinner.

1915–1920s John Whitehead was an aircraft manufacturer and received contracts from the British Government to build as many planes as possible. After World War 1, with a decline in sales, he was bankrupt and left the aircraft business.

1929 Neville Stack at National Flying Services formed his 'circus'; a formation-flying team of three de Havilland Moths.

1929 According to *Flight Global* October issue, "The mansion has been redecorated and luxuriously fitted out as a clubhouse; the accommodation includes a ballroom, writing room, dining room, drawing room, bar, lounges, dressing rooms and fourteen bedrooms. Excellent catering service

has been arranged, and nearly 1,000 meals were served to members during the first fortnight since opening."

1930 According to the *Motor Sport* archive, May issue, "An unexpected change in the weather favoured the National Flying Services Pageant, on Easter Monday. There was a record attendance, and long before the programme opened a big procession of spectators passed into the aerodrome. Not all came by road, and one counted no less than thirty visiting planes which landed during the afternoon. The Cinque Ports Club arrived en masse with Moths from Lympne, and Marcel Desoutter later flew over on his green-and-white Desoutter monoplane. As a 'curtain-raiser' there was the fly-past of machines, and then Flight-lieutenant H M Schofield carried out a quarter-of-an-hour's intensive stunting and crazy flying. An 'aerial pool' competition followed, in which the competing pilots were called upon to aim balls, ie bags of flour, into white circles marked out on the aerodrome. Hits were signalled by a man waving a flag."

A DeHavilland Gipsy Moth passes over the mount having taken off from the airfield in 1930. Photo from Brian Lucas

1931 "Scenes of tumultuous enthusiasm marked the arrival of the *Graf Zeppelin* at Hanworth. It was besieged by the crowd and guarded by mounted police."

"Dr Eckener was in a merry mood at a window of the *Graf Zeppelin* as he greets the welcoming cheers at Hanworth. Twenty-four aerial trippers, who paid £30 each, did the twenty-four-hour tour in the *Graf Zeppeli*n over Great Britain. The route was from Hanworth to the Sussex Coast, the Isle of Wight, Exeter, Teignmouth, to St David's Head and thence over the St George's Channel to Wexford, Waterford, Dublin, Belfast and to Glasgow, Edinburgh and down the East Coast back to London." (*The Sphere,* 22 August 1931.)

1935 "No 5 Elementary and Flying Training School was set-up at Hanworth, to train civilian pilots who, if passing, went on to train as RAF pilots." (From *No 5 E & RFTA, Hanworth Park* on the *Sidetracks in History* website.)

1947 Planes cease flying at Hanworth Air Park.

Thanks to Linda Pogson for her research on the interwar years at Hanworth.

The Mount today (Editor's note)

The mount was converted into an air-raid shelter in September 1939. Various comments in the *Hanworth Now and Then* Facebook Group mention getting inside the mount in the 50s and 60s. Stuart Baker says "We as kids played in it and the back wall opposite the entrance got dug away

In February 2022 the mount was once again heavily overgrown. The entrance can just be made out in this view. Photo Clive Penfold

and kids were burrowing into the mound. The earth that was removed was sandy silt and the same as the floor". Leslie Miles remembers "chatting with an old tramp" who was presumably living in the mount. David Fisher used the mount "as a loo if you got caught short on the way home from Oriel school". Brian Lucas also remembers "Being born and living about 200 metres from the Mount in 1950, it was a natural play ground (as was the Air Park behind it) for us local children, particularly the boys. After climbing the surrounding fence I went inside with friends a few times using our old `Pifco` bicycle lamps to illuminate the interior, albeit somewhat dimly, which gave it an eerie feeling. The entrance had an arched concrete (or such) doorway which, by the late 1950s, was half filled with soil which had possibly been washed off the Mount above the doorway, or this may also have been an attempt to stop anyone going inside, obviously it didn`t stop us kids!. We had to scramble over this soil and through the half filled doorway to get to the room inside. Inside was a small room around 8 or 10 ft square made of bricks, the floor was also brick. The walls appeared to have been painted a light whiteish colour, but whether this paint was original I don`t know as local reports are that the Mount was used as an air raid shelter by locals during WW2 so it could have been done then. There was no way of knowing how thick the walls were.

These days many local folklore stories are of tunnels leading from the room to various locations but no tunnels were visible then and there was certainly no evidence of any tunnels being bricked up either. I think a bricked up tunnel would leave what they today refer to as `witness marks` from maybe different bricks or mortar being used, of which I don`t remember any. I recall the inside as feeling cool, which I have since learnt from Katy Cox`s (and others) research would account for it being built as an `Ice House` for Hanworth Park House!"

The entrance into the mount and its wooden fenced compound is now secure and Hounslow council refuses all requests for access on health and safety grounds. Although cleared of all undergrowth in 2015, the mount and compound are now heavily overgrown.

Inventive Vents London Bus Tour

Nigel Headley

The Camberwell 'submarine'

Publication of a detailed and exciting booklet, *Inventive Vents,* put together by the Our Hut group, a charitable organisation whose purpose is to draw children and interested parties into appreciating the buildings and surroundings within London's urban landscape, created something of a stir amongst those of us who had read it. Vents are of course just the surface manifestation of what's going on underground.

The offer of a vintage Routemaster bus tour for Sub Brit with a guide and commentary proved too much to resist and was arranged for the first Sunday in March. After days of grim weather we woke up to bright skies and an almost warm sun.

Starting point was the great concrete-arched Stockwell bus garage; cleverly designed with a cathedral-like interior that forms an uninterrupted space allowing over two hundred buses to be stored and serviced. A jumbo jet would have taxied comfortably within this impressive Grade 2 listed structure.

We were greeted by our hosts and co-authors of the book Lucy Lavers, Suzanna Prizeman and Judy Ovens, ably supported by Judy's husband and editor Richard Duguid.

Stockwell bus garage

The bus journey started with a very loud ping on the bell and cry of "Hold very tight now". First stop was the Camberwell 'submarine'. A large area of wartime-devastated London was being redeveloped and in 1974 a young architect on his first commission was given free rein to design an underground boiler-house for a housing estate being constructed around it. He came up with a long submarine-like structure with two towering slender vents at either end.

All aboard the Routemaster bus.
Our guide gives a running commentary

Safe now in the nation's heritage, it has been vulnerable to demolition plans but more recently its architectural merits have become more appreciated and it's safe. Well worth a detour in these quiet residential streets.

Sub Britters learn about the Camberwell 'submarine'

Reboarding the bus, we headed towards Oval tube station. No stop this time but we did see the octagonal building on open ground facing the station. This brick construction was open-topped and protected by a covering net. It was an air vent communicating with one of the Northern line tube tunnels below.

Northern line vent shaft opposite Oval station

We were told in advance that lucky watchers might catch sight of this netting rising up as a tube train passed beneath. As we cruised slowly past nothing happened, but then a loud cheer went up from the back of the bus to indicate that the top deck had indeed seen this wonderful waft just in time!

From there our route took us to Lambeth Road; just south from the riverside Lambeth Palace. We dismounted once again by a very large free-standing concrete construction with side grills at 109 Lambeth Road.

This bold but brutalist vent cools the electricity substation beneath. It is the power supply for the adjacent building which houses the Metropolitan Police forensic science laboratory and an emergency call centre which needs to be isolated from the National Grid and the risk of a power cut.

Electricity substation vent at 109 Lambeth Road

Time to head north across Lambeth Bridge and then right towards Parliament Square. Our hosts reminded us of the story of how Whitehall's secret underground tunnel network was penetrated by Duncan Campbell in 1980 when he found an open door and rode his bicycle throughout the network in one of the great Cold War exposures of the day.

We were shown two circular low-level structures outside the Queen Elizabeth II conference centre opposite Westminster Abbey. It turns out that these are vents to the secret tunnel system.

Although we did not leave the bus at this point, we were reminded of the very pertinent relevance of the area by the loud flag-waving crowd of Ukrainian supporters protesting the recent tragic invasion.

At this point we discovered just how manoeuvrable the old Routemaster is: many streets were partly closed off

One of two vents for the WW2 deep level cable tunnels. Photo Jamie Gannon

and wider more modern buses would have struggled with the barriers and narrow streets.

We were headed now for Pimlico and Moreton Terrace. At this point we crossed paths with the track of the Victoria line. During its construction a series of vents were created at stations and midway points between them which effectively map out the line of the tracks underground.

The Victoria Line vent shaft in Moreton Terrace

One such midpoint is to be found at 37/39 Moreton Terrace. Four houses in a Georgian street terrace were demolished to create this vent shaft. After construction the facing of the buildings was rebuilt although windows and some details were omitted; this allows you to spot the site unobtrusively. Vehicular access is retained and the shaft is enclosed within. It's a very impressive reinstatement of the street architecture.

We now headed deeper into Pimlico and to the famous air vent designed by the legendary Eduardo Paolozzi at Bessborough Street close to the tube station. No longer functional, it is a Grade 2 listed structure, and artwork in its own right. It comprises a tall cuboid metal sculpture with panels of cast metal and deep reliefs with much decoration and tubular openings.

Eduardo Paolozzi's Grade 2 listed vent shaft in Pimlico

This is a complex piece worthy of much study and probably a permanent display in Tate Modern. Intriguingly one of our party was able to furnish previously unknown facts about its use. He had been working near the project at the time of its construction and there was more than a hint of government secrecy and mystery about it.

Rejoining the Embankment, we now headed west and passed the western pumping station adjacent to the bridge and approach tracks to Victoria station. Here there is a very tall and elegant chimney; brick-built and Italianate, it was part of Joseph Bazalgette's sewage management plan. At this point the low-level sewage needs to be raised 21ft, enough to progress to Abbey Mills in the east. When constructed it was a chimney for steam engine pumps. Today that smoke is long gone and it acts purely as sewer ventilation.

Continuing west on the Embankment we were shown a sizeable new promontory facing the Battersea Park waterfront from the old line of the river. This is a pedestrianised area of new landscaped public space created by the Thames Tideway project which has flues and vents linking to the new super sewer far below.

Now on our way home we crossed back over the Thames to view the spectacular Battersea power station development. To our left were the new Riverhall buildings with highly modern steel sentry-like vents and coloured grills to indicate usage – red for hot air and blue for cool. To our right on the other side of the road were a series of tall slender original cast-iron stink pipes venting sewer gas, unchanged for 150 years.

Joseph Bazalgette's Italianate chimney at Western Pumping station. The entrance to the Grosvenor Canal is seen on the left. Photo George Rex

On our way back to Stockwell bus garage we saw a Victoria Line vent in Wandsworth Road, Vauxhall Cross

The tour was a great success and revealed the wealth of interest to be found in this much neglected interface between dark and light. The book is filled with countless more examples in so many different styles. Perhaps another bus trip is indicated?

Huge thanks to the team who designed the project and led us so ably round their many places of interest.

All photos Clive Penfold unless stated

Llechwedd Quarry

Meirionydd

A decorative panel at Llechwedd Slate Quarry displays some of the many hues of Welsh slate

My love for Llechwedd began in the 1970s when my family would return to Wales. I would pester them to return again and again to Llechwedd and the nearby Gloddfa Ganol site.

Gloddfa Ganol was part of the Oakeley group of slate quarries, a separate undertaking from Llechwedd. From 1974 to 1998 it offered a train journey into an adit level, Land Rover tours and an extensive narrow-gauge railway museum. Indeed the engineering genius and collector Rich Morris even had a steam *Monolco* monorail system in his back garden next to the sites. This is now at the Tanat Valley Railway near Welshpool.

The Industry

Slate, often found in surface outcrops, has been quarried around the western side of Britain for 1,800 years. The slate vein was formed by extreme heat and compression in the Ordovician period, 485 to 443 million years ago. The word *slate* is said to be derived from the French *esclater* – to split. In Welsh, slate is *llechi,* quarry is *chwarel,* and quarryman is *chwarelwyr*.

In this area of North Wales, part of the former county of Merionethshire, the slate forms a crescent at the end of the Vale of Ffestiniog. This was worked by a run of quarries: Croesor – Rhosydd – Cwmorthin – Gloddfa Ganol (Middle Quarry) – Oakeley; then across the

Gloddfa Ganol: a Kerr, Stuart & Co 3014 Joffre Class locomotive stands at the head of the Dinas Incline in 1992. Photo Gillett's Crossing [Reproduced under Creative Commons licence]

Crimea Pass east to Llechwedd-Votty (Foty) – Bowydd – Maenofferen – Diffwys/Duffws – Rhiwbach – Manod/ Cwt y Bugail (Shepherd's Hut).

Many more of these quarries, surface and below ground, were not as successful. Some were absorbed into larger quarries, some abandoned. Occupying part of a large expanse of moorland known as the Migneint, at over 1,600 ft above sea level it was a barren, windswept place in which to work.

The rugged terrain of the Merioneth slate belt: Cwmorthin Quarry, viewed from Rhosydd Quarry, looking towards the Vale of Ffestiniog. Photo Tim Wellburn

At its peak in 1890 the slate industry directly employed 17,000 people within the area of the modern county of Gwynedd. Its annual production of almost 500,000 tonnes supplied one third of the total worldwide demand for roofing slate.

In the Blaenau Ffestiniog area over 1,600 people were directly employed in 1873, of which some 330 were employed by Llechwedd Quarry. At Maenofferen the 30° sloping high-quality veins of slate were mined up to almost 2,000 ft above sea level. Adits and sloped incline shafts were sunk to access the angled veins.

Llechwedd Quarry

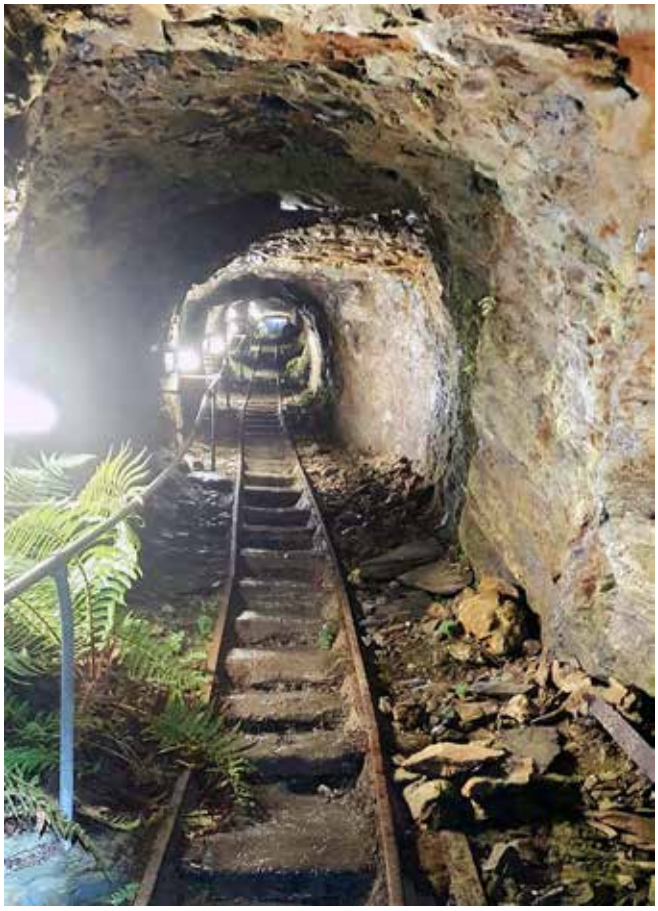
The Llechwedd land is owned by Lord Newborough's estate. One of the first quarries on this site – dating from the 1760s – was Lord Quarry (Diffwys). In 1833 the site was leased to John Whitehead Greaves and remains in the Greaves family today.

Llechwedd quarry was worked on some sixteen different levels, both above and below the entrance level: the lower workings are called 'levels' while those rising up the hillside above are referred to as 'floors', numbered from 1 to 7 in ascending order. From the top of the mountain to the deepest workings was greater than the height of the Eiffel Tower.

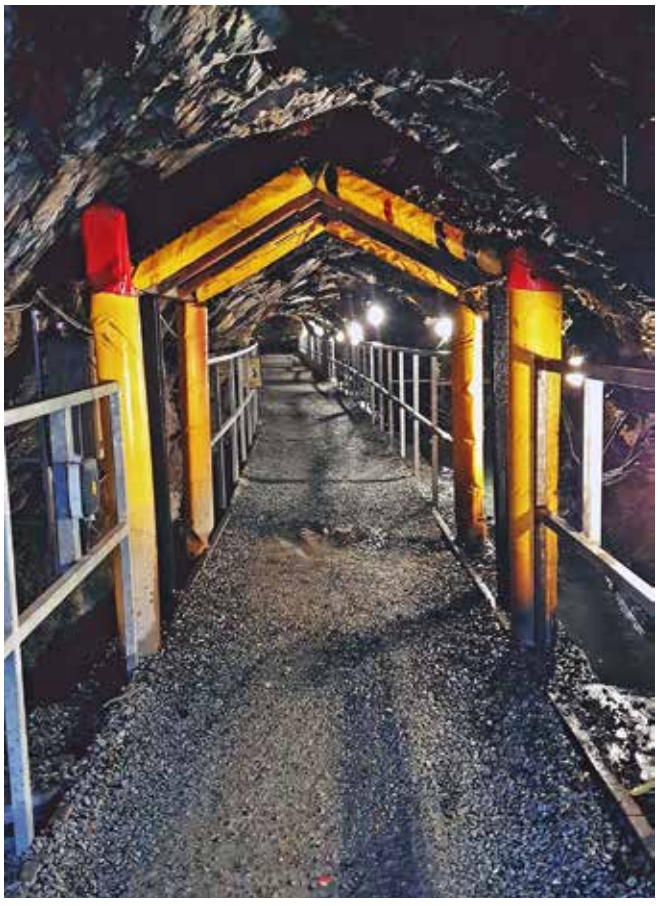
The levels are designated alphabetically, from A to I (?) but are flooded below level C. Levels A and B were also flooded for seventy years prior to the quarry's reopening as a visitor attraction in the early 1970s. These are now kept dry by pumping. Some say that there was a level R but different numbering systems and trial levels, now flooded below C, confuse the issue, as do changes in ownership and amalgamation of quarries, resulting in changes to the boundaries of the Llechwedd workings.

Llechwedd Quarry Mills and Stackyard, c.1895. Gwynedd Archive Service

Llechwedd had 25 miles or more of underground workings. It is said there were 200 miles of tunnels within three miles of Blaenau Ffestiniog. Some of these later found new roles. In World War II, nearby Manod Quarry was used to house the National Gallery's art treasures – see *Subterranea 57*. Today Llechwedd houses 20kg wheels of South Caernarfonshire Dairy's cheese in racks. In a near average 7°C environment it matures this special cheese in around ten weeks. The cheeses are moved in and out of the storage cavern using the tourist inclined tramway before the visitors arrive.



Llechwedd Quarry: one of the underground inclines, here looking up from B Level. Photo Llechwedd Slate Caverns



One of the former haulage tramways within Level B of Llechwedd – now adapted a visitors' walking route. Photo Llechwedd Slate Caverns

Racks of maturing cheese in one of Llechwedd's caverns. Photo Llechwedd Slate Caverns

Tramways

The Ffestiniog quarries became linked by a series of inclines and narrow-gauge tramways and railways. To the east was the Rhiwbach tramway of over three miles, using three main inclines to link the 'eastern' quarries. These were originally horse-drawn and gravity-activated, the weight of the descending loaded wagons serving to haul the empties back up the incline. It is believed that Gwynedd has the greatest number of former tramway inclines in the world.

In the 1920s petrol locomotives were obtained for surface haulage but they proved too heavy for the track laid on marshy ground. Lighter Simplex-type diesel locomotives were used in the period around 1953–1961, but these were the industry's twilight years, the demand for slate having greatly declined by then.

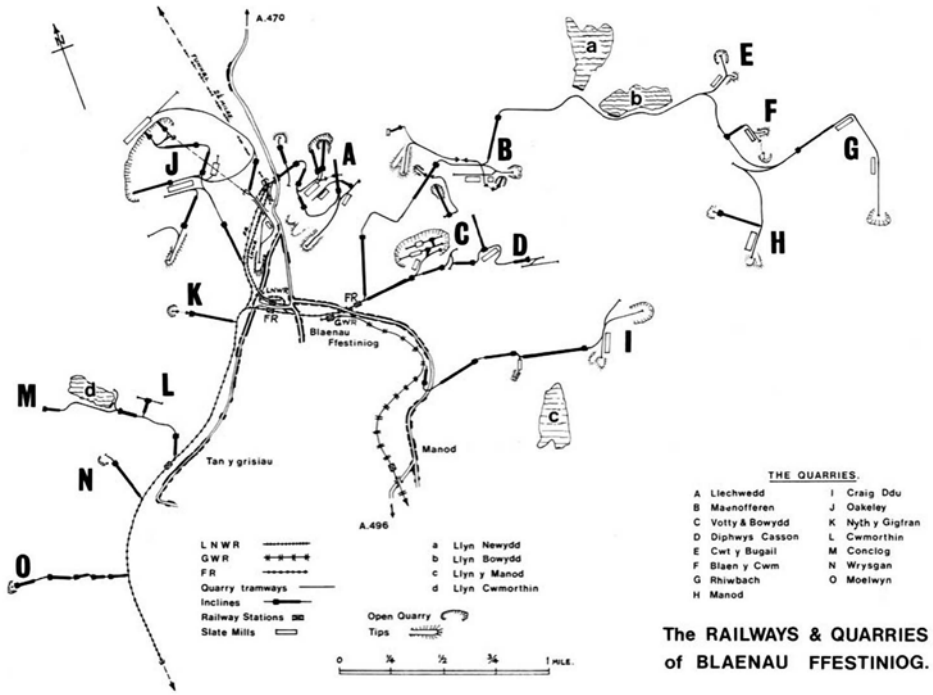
The LNWR Ffestiniog Tunnel was opened in 1879. It was the UK's longest single-track tunnel at 2 miles 328 yards. Llechwedd was linked to its entrance yard sidings by its own incline tramway. Finished slates could be taken north to Deganwy port, near Llandudno, avoiding the Festiniog Railway's higher tolls to Portmadoc. The Oakeley and Cwmorthin quarries also loaded their slates at this once very busy, multi-level exchange yard.

Chwarelwyr

Typically a group of four quarrymen (*chwarelwyr*) would make a monthly bargain (*bargein*) with the quarry manager as to how much slate they could extract and finish. Two men would work a chamber – spending most of their lives in candlelight. The candles were supplied by the quarry owners as were tools, gunpowder, tool-sharpening and even their rented homes, all at a huge profit.

A good chamber, after being worked by hand for fifteen years, would be 60 ft long by 80 ft high. Injuries were common: from roof falls to explosives injuries it was a dangerous place to be. Moreover, the slate dust caused silicosis. It would scar a man's lungs, slowly choking him to death as it solidified inside. The average age of a *chwarelwyr* at his death was 40.

The quarrymen's union was strong and, with small monthly contributions, hospitals were built. The former quarry hospital, later the War Memorial Hospital in Blaenau Ffestiniog, was opened in 1927, pre-dating the National Health Service by 21 years.



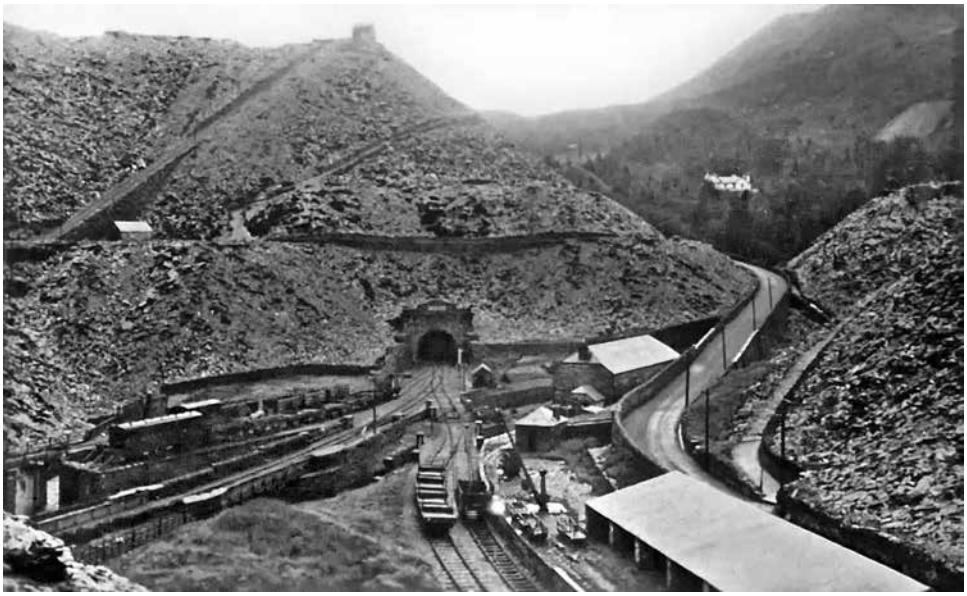
This plan shows the profusion of quarries linked by tramways into the narrow- and standard gauge lines serving Blaenau Ffestiniog. G Hatherill, 1977

Mechanical Innovation

From 1860 to 1930 Llechwedd and the area was a thriving centre of innovation and technology.

Moses Kellow's compressed air drill could drill a 2-inch diameter hole six feet deep in 90 seconds. Previously, one man, without gloves, would drop and rotate a heavy iron bar called a 'jumper'. If he was lucky it would have taken him over eight hours to drill a similar hole in which to place gunpowder for blasting.

At Maenofferen there are two trial early boring machine tunnels, and there is another at Votty. They used the Cooke and Hunter machine, patented in 1864. This was powered by a pressurised water turbine with a geared mechanism driving rotating boring teeth and could bore a tunnel of up to seven ft diameter at a rate of approximately six inches per hour.



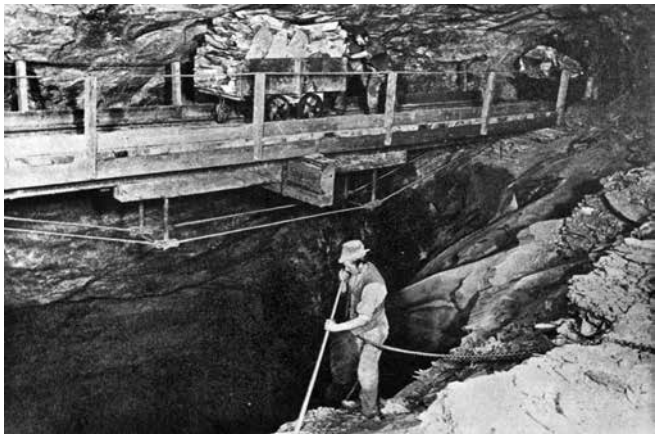
The Blaenau Ffestiniog tunnel portal of the 1879 LNWR Conwy Valley Line. To either side are quarry exchange sidings. The Llechwedd incline runs behind the 1890 Pant yr Afon hydro-electric power station, situated to the right of the portal. Gwynedd Archive Service

The enormous size of many slate chambers is hard to comprehend. This view, of a typical chamber in Cwmorthin Quarry, would never have been seen by the candlelight of the chwarelwyr who created it. Photo Tim Wellburn

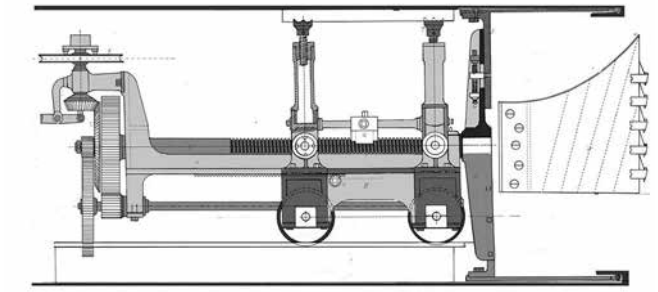
Electrification

The excess of surface water, together with pumped water from underground, was used in the world's first hydro-electric power generation. Llechwedd had two such generating plants for their huge factories finishing the hewn slate. Originally, machinery had been powered by waterwheels driving geared overhead rods fitted with pulleys and drive-belts. These were later replaced with electric motors.

In 1890 the Pant yr Afon hydro-electric power plant was opened, sited next to the Ffestiniog tunnel on the LNWR Conwy Valley railway line. This utilised two Gikes Pelton wheels driving a pair of Johnson and Philips 175kw generators, feeding into the national grid. In 1904 Blaenau Ffestiniog was one of the first towns to have electric street lighting.



A quarryman drills a blasting hole with a 'jumper'. The chain round his thigh provided the means to scale and work a rock face. In the background, two men push a waste wagon across a bridge spanning two joined-up chambers. Gwynedd Archive Service



Hunter's 1864 Patent No 1244 for a Tunnelling Machine. J G Isherwood, The Hunter Machines

One of the pair of 1927 electric locomotives converted from quarry steam locomotives at Llechwedd by the General Electric Co Ltd. The wagon coupled behind is a gunpowder van. Llechwedd Slate Caverns

Hydro-electric power on site also enabled overhead power for the locomotives *Coalition* and *Eclipse* on a 220v DC power supply. These were two former steam locomotives on the Llechwedd quarry rail network that were converted to use electric motive power. They survived into preservation, but in 2019 were moved to Statfold barn for urgent restoration after being displayed for years in the area's challenging 'micro climate'. Battery electric haulage was also used deep underground, in the mills and around the surface of the quarry.

The cab of the electric locomotive, pre-restoration. Power for the 15hp motor (visible under the engine cowling) was received through a pantograph mounted on the cab roof

A British Electric Vehicles battery-powered locomotive, used for haulage at Llechwedd in place of horses, from 1921. Gwynedd Archive Service

Heritage, tourism and the future

From 1972 three 'modern' British Electric Vehicles battery locomotives took visitors to Llechwedd 800 metres into the mountain on the much-loved Quarry Tours "Miners' Tramway". They had been refurbished at the Festiniog Railway's Boston Lodge Works in 1971–72, having previously seen use in civil engineering projects such as the Scottish Askham hydro schemes, Mount Wellington tin mines in Cornwall and the Bristol sewage system works.

Visitors to Llechwedd are hauled back into daylight by a BEV battery locomotive in the early days of the 1972 "Miners' Tramway". Llechwedd Slate Caverns

The locomotives were sold on as part of a revitalisation of the Llechwedd visitor experience in which *The Cathedral* and *The Victorian Chamber* became part of Zipworld's unique underground adventure activities, including zipwires, a triple-level trampoline and a *via ferrata* (protected climbing) challenge course around the chambers.

Wide range of activities

The *Deep Mine Tour* was originally a sunken open pit at the visitor centre level. A basic incline with steps was used to provide access into the quarry. In its present incarnation visitors descend from the surface to A level on a 420ft-long 3ft-gauge cable railway, in parts with a gradient of 1:1.8 (30°). The tour continues on foot to B level, taking in ten chambers with displays of light projection and 'enhanced reality technology'.

The *Deep Mine Tour* was taken over by Zipworld in 2021 and it is hoped that they may continue Llechwedd's prior practice of offering extended tours for special interest groups such as mining, photography, geology or history.

Accommodation and mountain biking

The Greaves family remain on site having developed 'Glamping' pods. At the entrance is the superbly refurbished Plas Weunydd hotel – originally the

The 3ft gauge incline which takes visitors down as far as A level. The winch is computer-controlled by a Siemens Iconsys system. Llechwedd Slate Caverns

residence of John Whitehead Greaves and having long associations with Robert Baden Powell and the architect Clough Williams Ellis of Portmeirion fame. Opposite here is the world-class Stiniog downhill mountain bike course. Above is the mighty Maenofferen mill complex, awaiting restoration plans.

Slate continues to be mined on site by Greaves Welsh Slate Ltd, using surface untopping to access and recover the pillars of slate left behind to support the roof of the old underground workings. Currently slate is used in horticultural dressings, road construction, cosmetics and even toothpaste.

Once Maenofferen-Llechwedd had a 'professor' who was working on a process involving heat, pressure and resin to use slate dust to create moulded forms and breeze-block type insulation. Perhaps this will be a viable future for the slate waste all around? Perhaps one day some of the hillsides will be returned to greenery again as the valuable slate 'waste' is harvested for sustainable uses?

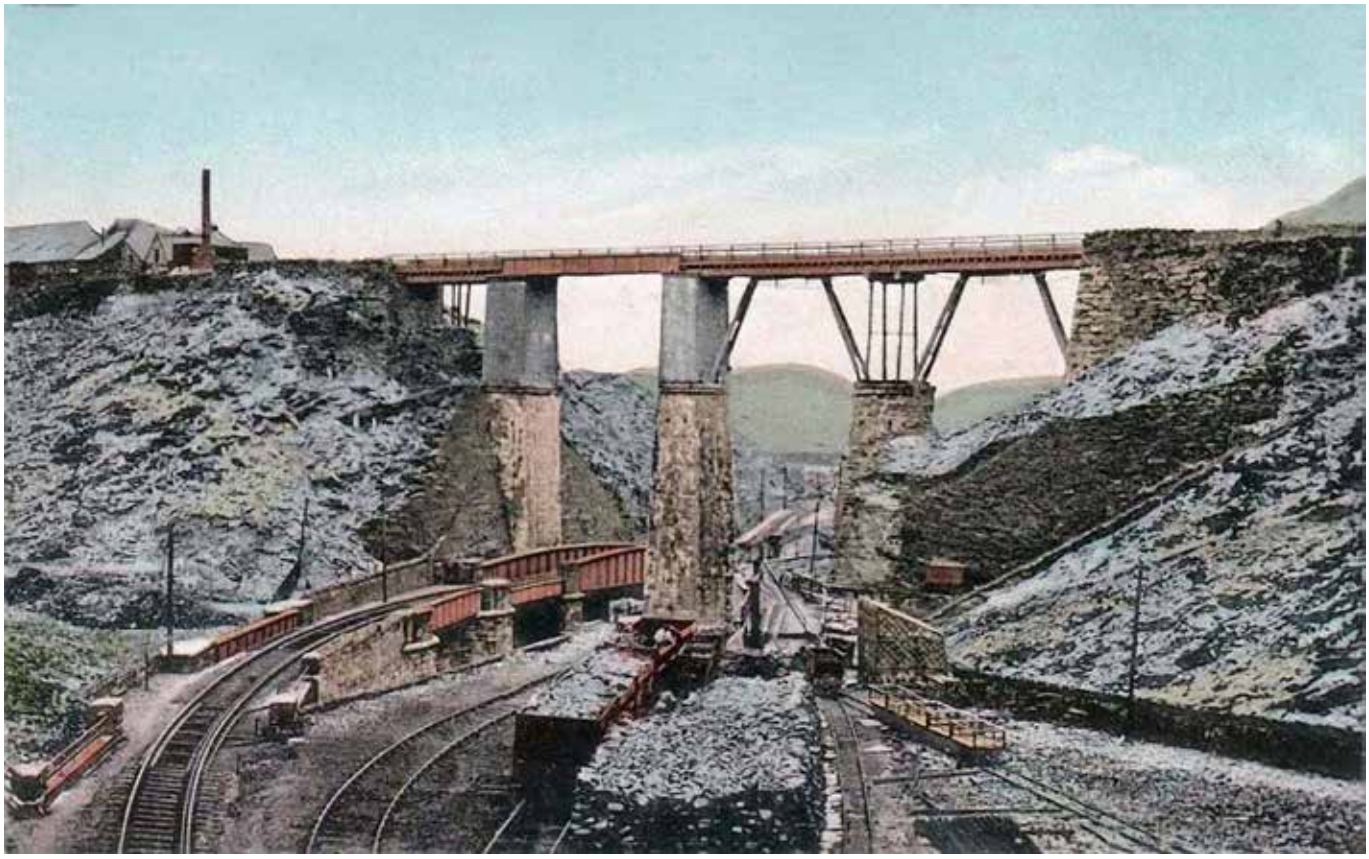
The Slate Landscape of Northwest Wales, including the Ffestiniog area quarries described here, achieved UNESCO World Heritage status in July 2021.

Visitors continue the Deep Mine Tour on foot through a worked-out chamber en route to level B. Llechwedd Slate Caverns

Further reading and reference

This is an enormous subject, rich in history. I recommend works by:
Ivor Wynne Jones
Alun John Richards
JIC Boyd (Narrow Gauge Railways)
Geoffrey P Isherwood & his son, Graham G Isherwood
Dr David Gwyn
Gordon and Ann Hatherhill

Alexander Cordell, *This Sweet and Bitter Earth*, 1977
John Wardley, *Creating my own Nemesis*, 2013 (autobiography of the creator of Llechwedd's *Deep Mine* tour/incline and many theme parks.)
Y Chwarelwyr, Sir Ifan ab Owen Edwards and John Ellis Williams, 1935 (the first Welsh language film with sound track, set around Llechwedd).
www.penmorfa.com – a compendium website with much material on the Welsh slate industry.



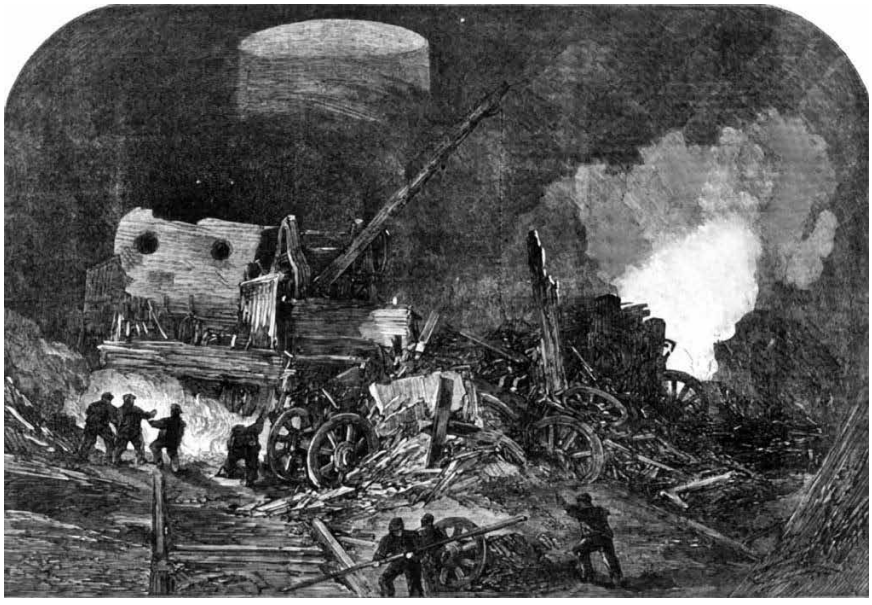
Remembrance of things past: Victorian enterprise roofed the world and, in so doing, created a unique landscape legacy

Three-train crash and fire in Welwyn North tunnel, Hertfordshire, June 1866

Paul W. Sowan

In June 1866, at around midnight on a Saturday night, an empty down (away from London) coal train failed near the centre of the Welwyn North tunnel in Hertfordshire, over a quarter of a mile underground from either portal. A following down goods train ran into the back of it, resulting in debris from the collision being thrown onto the up line. Then an up goods train (towards London) ran into the scattered wreckage. All three trains being worked by steam locomotives, a fire ensued which destroyed a quantity of carriages, waggons and merchandise. Two lives were lost, one immediately and the other a few days later from injuries.

There are two single bore double track tunnels between Welwyn North and Knebworth stations, both driven in 1849 – 50 for the Great Northern Railway. Welwyn South tunnel is of 429 yards, and Welwyn North 1046 yards. Welwyn North station is about 250 yards south of the South tunnel, and Knebworth station is around a mile and a half north of the North tunnel. The line was in 1866, and is still in 2014, the main line from London to York, Newcastle and Edinburgh.



Engraving from Illustrated London News 1866

From the *Illustrated London News* we learn …

> A railway accident of a strangely complicated nature took place, on Saturday night [9 June 1866], in the Welwyn tunnel, on the Great Northern line, twenty-two miles from King's-cross. A train of empty coal-waggons was going down the line, about midnight, when some defect in the engine brought it to a stop in the middle of the tunnel, which is three quarters of a mile long. A Midland Railway goods-train, which came down the line soon afterwards, was allowed, by some neglect or mistake of the signalman, to enter the tunnel, without waiting for the signal that the tunnel was clear, as is prescribed by the ordinary regulations of the Great Northern line. It ran into the coal-waggons with tremendous force. The guard of the first train, Joseph Ray, was killed on the spot; John Rawlings, a man who was with him in his break [ie brake van], was so mangled and mutilated that he died on Wednesday morning [13 June]; and the engine of the second train, with several of its waggons, was thrown across the up line, so as to block that which had previously been unimpeded. Scarcely had this second mishap when a Great Northern up goods-train arrived, and, dashing into the engine and waggons of the Midland train, which were lying across its line, completed the disaster. In a few moments it was discovered that the engine of the Great Northern train had turned over, and that the goods and waggons of the Midland train had become ignited from the burning coal and cinders of the engine furnaces scattered about, Both drivers and firemen of all the engines had escaped either unhurt or with but slight injuries, and, having signalled to the nearest stations, both up and down, they took up the body of Ray, which was lying, crushed and mutilated, near the ruins of his break; they next took care of Rawlings and of a third man, Lacey, guard of the up train, who was also severely injured. By this time all three trains were on fire. A message was telegraphed to Mr. Seymour Clarke, the general manager of the line, who lives at Hatfield, and a large number of men were employed to get out what waggons they could, but the suffocating character of the smoke, and the heat of the fire from the ruins of the carriages and merchandise, prevented their efforts being very effective. Although there was a force of 200 men, under Superintendent Williams, collected at two o'clock in the morning, they could not approach the seat of the conflagration. Thirty-six carriages or trucks, of which thirteen belonged to the Midland, were burning in the tunnel. Frequent explosions, with discharges of

smoke and flame, besides the fierce heat, made it impossible for the men to enter. They had no supply of water, and it was therefore decided to let the fire burn itself out. It continued to rage all Sunday, without any intermission till six o'clock in the afternoon, when it was sufficiently reduced to enable the men to enter the tunnel, led by Superintendent Williams, with the Hatfield engine, lent to the company by the Marquis of Salisbury; and, a supply of water having been obtained, the engine was set to work, as the ruins were still burning. In the mean time the whole of the traffic had been carried on along the Hertford branch and the Cambridge branch, via Royston and Hitchin, of the Great Eastern Railway, It was not till nine o'clock in the evening that the tunnel was cleared. The work of removing the wreck was carried on under the direction of Mr. R. Johnson, the engineer of the line, with a force of about 450 navvies and fitters, and labourers working in relays. The entire scene of ruin was confined to a space of about 100 yards in the centre of the tunnel. Our Illustration gives a view of the mass of broken trucks and carriages. The men attacked this at each end, working away with picks and crowbars, and carrying off large portions of the wreck. As they made their way towards the centre of the mass they found the fire still smouldering, and as this was immediately under a shaft [to the surface] the draughts of air which it supplied ever and anon fanned the dying embers into a flame. Then was brought into play the powerful fire-engine, worked by fourteen sturdy navvies and supplied with water from tenders brought to the spot by cautiously-guided engines, whistling and screeching as they approached the scene of operations. They were dragged up by other engines and two powerful 10-ton or 12-ton cranes, one at each end. To them, by chains and tackling, were made fast such heavy gear as men without machinery would be powerless to move, and then the ponderous mass was slowly dragged out of the tunnel. In this way, after hours of well-directed labour, the line was at length cleared; the engines and tenders were set upon their wheels once more; the remains of the trucks were safely got out; the fragments of springs, of bolts, of nuts, of twisted rails, of telegraph-wire, of wheels, of screws and crowbars, and coke and coal, and other articles, were removed, and the line was open that night for the passage of goods-trains only; but Mr. Johnson took care to make a minute inspection of the tunnel before permitting passenger-trains to traverse it. The sides and roofing of the tunnel are composed of five rings of brickwork, and as the injury done to the bricks appears to be only superficial, the safety of the tunnel is not endangered.

An inquest on the bodies of the two men killed was held on Tuesday at the Cowper Arms, Welwyn, by Mr. Sworder, Coroner for that division of Herts. The evidence showed that the stoppage of the first train was occasioned by the bursting of a pipe in the engine. The signalman at Welwyn, James Bradford, had telegraphed to Knebworth, the station at the other end of the tunnel, at 11.36 p.m. to ask if the line was clear, and swears positively that he received for answer the word "Yes". On receiving this answer he exhibited the "all right" signal, and shortly afterwards admitted the Midland train, laden with provisions and corn, which ran into the train of empty coal-waggons in the tunnel. Joseph Harding, the signalman at Knebworth, swears also most positively that the answer he gave to the inquiry whether the line was clear was "No". To this discrepancy the accident is clearly due, and as the two signalmen directly contradict each other, "The jury would not take on themselves the responsibility of attributing blame to either".

Welwyn North Tunnel

As this report appeared in the *Illustrated London News* dated 16 June (a Saturday), it appears at first sight that the event described was the preceding Saturday, 9 June. However, as John Rawling is said to have died on a Wednesday, and his inquest held on a Tuesday, it seems that the report was in fact published a fortnight, rather than a week, after the accident, which would then have been 2 June.

The dramatic picture illustrating this report depicts an astonishingly spacious tunnel for just two lines of rails, and men reduced to almost ant proportions labouring with the wreckage. If the rails shown are standard gauge (which of course they were), four feet eight and a half inches apart, then the men shown were clearly all dwarfs!

SOURCE: ANON, 1866, Collision and burning of three trains in a tunnel. *Illustrated London News,* 16 June 1866, 589 – 590.

The Sub Brit Forum
-or- How to keep up to date with events and news

If you are not using the Sub Brit Forum you will be missing out on news about events and on general information and discussion on underground matters. But did you know that you can still get any category of Forum posts **emailed** to you? To get this set up you will need to log on to the Forum at least once (see below). Once you are set up you can even reply by email to topics and automatically update the Forum. Here are some hints to help you.

First, Log on to the Forum (see below). Have a look round the Forum to see what's there.

You can browse **Categories** (eg 'Cold War', 'Transport') by clicking on 'Categories' in the middle of the top line (or in the box, top left, for a fuller display).

You can search for **Topics** (eg 'Tube Map') by using the 'Magnifying Glass' symbol near the top right-hand corner.

To get back to the Forum Home Page, click 'Subterranea Britannica' on the black banner.

To get **emails** (notifications) about material posted to the Forum:

click on the big bold letter (this will be the first letter of your username) or your photo, (if you've set one up) in the top right-hand corner

select the little man symbol, and then click 'Preferences'

then 'Categories', under 'Notifications' down the left-hand side

Select the categories you want to be notified about using the boxes on the screen.

You can also stop emails ('mute') about a topic or category here.

Another way to get email notifications, once you know the Categories you look at most:

1. Navigate to 'Categories' from the main Forum page.
2. Click the Category of interest.
3. In the top right-hand corner, click the button marked with a '🔔' next to 'New Topic' and select the type of notification you want. You will then get emails for every post here.
4. You can change your preferences at any time.

And if you don't want anything emailed to you – then we suggest you just browse the Forum!

How to log on to the Forum – reminder

* Go to https://community.subbrit.org.uk

* Log in using your membership username and password.

If you've forgotten them use 'Activate my account / Reset my password'.